US Army Corps
of Engineers
Detroit District

FEASIBILITY STUDY FOR THE BOARDMAN RIVER

GRAND TRAVERSE COUNTY, MICHIGAN

APPENDIX C - COST ENGINEERING

GREAT LAKES FISHERIES AND ECOSYSTEM RESTORATION PROGRAM

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1 PURPOSE AND SCOPE OF COST ENGINEERING APPENDIX

This technical appendix presents an overview of the project, a description of alternatives considered, the methodology for cost estimating and detailed costs for the selected alternative, or National Ecosystem Restoration (NER) Plan. Detailed costs prepared using the Micro-Computer Aided Cost Estimating System (MCACES), Second Generation (MII) software are presented.

2 PROJECT OVERVIEW

The Feasibility Study for the Boardman River explores the potential to restore tributary habitat for fish by restoring the connectivity and coldwater characteristics of the Boardman River and potentially increasing the diversity of species moving between the Great Lakes and the river. This is accomplished by evaluating the potential modification or removal of the four dams. Restoration of habitat has been identified as a high priority for the entire Great Lakes Basin the support plan for the Great Lakes Fishery and Ecosystem Restoration program.

The project objectives include reconnecting and restoring tributary habitat, allowing unimpeded movement of woody debris and sediment materials through the river system, negating thermal disruption, and restoring the natural balance between coldwater and coolwater species. These objectives shall be accomplished without transporting pollutants into Grand Traverse Bay of Lake Michigan or allowing upstream migration of aquatic invasive species.

3 IDENTIFICATION OF MEASURES

Development of alternative plans followed a two-step process. First, measures to address problems and opportunities were identified at a conceptual level. Then these measures were combined in alternative plans using a tiered evaluation of conceptual level costs and environmental benefits. The alternative plans then underwent a detailed evaluation to identify a preferred alternative.

Based on the results of past studies and plans for the Boardman River dams, a menu of measures was developed to address the identified problems and opportunities. These measures include no action, creating systems to allow fish passage over or around the dams, and the removal of the dams and restoration of the waterway.

Screening level cost estimates were prepared for the various measures identified in the Detailed Project Report (DPR). The costs estimates for each of the measures were developed from unit costs obtained from local contractors, approximated based on previously bid projects or from published unit costs (Michigan Department of Transportation [MDOT] Weighted Average Item Price Report). The overall project costs were then compared to similar projects in the region to verify the validity of the

estimates. Below is a brief discussion of major cost components of each measure and a description of the assumptions associated with those costs.

3.1 FULL / PARTIAL DAM REMOVAL MEASURES

Cost estimates are provided in Attachment 1 for the full removal of the Sabin and Boardman Dams. For each dam an "expected" and "high" cost was developed. The "expected" cost is the cost that is most likely to occur based on the information currently available. The "high" cost is an estimate of costs if the worst case assumptions prove to be correct. The cost differences between the "expected" and "high" costs are entirely a result of contaminated sediment issues.

3.1.1 Union Street Dam

The Union Street Dam is not proposed for full or partial removal because of concerns related to upstream migration of aquatic nuisance species.

3.1.2 Sabin Dam

The majority of the costs in the dam removal option are in earthwork. The earthwork is comprised of three different earth moving operations: floodplain and dry channel excavation, embankment earth, and sediment trap cleaning. The floodplain and dry channel excavation is work that is anticipated to be in the dry. However, since bearing capacities of the soils in the impoundments is unknown, the excavation method anticipated is using small dozers, excavators and dump trucks on haul roads. Embankment earth would likely be removed with dump trucks and dozers. The sediment trap cleaning would likely be conducted with a stationary excavator and dump truck.

Sediments within the Sabin impoundment have been shown to have elevated levels of some contaminants. Based on the available data the levels are above background and direct contact values for residential areas. However, based on site specific criteria approved by the Michigan Department of Environmental Quality (MDEQ) for recreational areas that are expected to be similar to the restored Sabin river corridor there would be no mitigation required. This assumes that soil samples taken after dam removal are less than the site specific criteria of 18 milligrams per kilogram for arsenic (Note: all sediment samples collected in the Sabin impoundment have been below this limit).

Another significant cost associated with the project is the actual breaching of the dam. The breaching plan entails notching and removing concrete at the Sabin Dam spillway to lower the impoundment water surface elevation at a maximum rate of one foot per day. This would minimize velocities and sediment transport outside of channel areas, and therefore minimize the need for active sediment management. During the drawdown process, sediment traps would be maintained immediately above and below the breach, as well as throughout the impoundment.

3.1.3 Boardman Dam

The majority of the costs in the dam removal option are in earthwork. The earthwork comprises three different earth moving operations: floodplain and dry channel excavation, embankment earth, and sediment trap cleaning. The floodplain and dry channel excavation is work that is anticipated to be in the dry. However, since bearing capacities of the soils in the impoundments are unknown, the excavation method anticipated is using small dozers, excavators and dump trucks on haul roads. Embankment earth would likely be removed with dump trucks and dozers. The sediment trap cleaning would likely be conducted with a stationary excavator and dump truck.

Sediments within the Boardman impoundment have been shown to have elevated levels of some contaminants. Based on the available data the levels are above background and direct contact values for residential areas. However, based on site specific criteria approved by MDEQ for recreational areas that are expected to be similar to the restored Sabin river corridor there would be no mitigation required. This assumes that soil samples taken after dam removal are less than the site specific criteria of 18 milligrams per kilogram for arsenic (Note: all sediment samples collected in the Sabin impoundment have been below this limit).

Another significant cost associated with the project is the actual breaching of the dam. The breaching plan entails entails pumping water out of the impoundment, over the earthen berm, and into the newly constructed channel downstream. The bypass pumping would require pumping at a variable rate that would drawdown the impoundment approximately one foot per day. Additional pumps would be maintained onsite in the event of larger flows. During the drawdown, the contractor would begin removing the earthen berm, always maintaining a minimum of 5 feet of freeboard until the impoundment level is within three feet of the proposed river profile. At such time, the contractor would complete removal of the earthen dam. As a redundant safety measure, the contractor shall have onsite flexible hard armor mats (ArmorFlex) to place in a constructed channel across the earthen berms, should the pumps fail. This would prevent excessive scour, provide structural support for the earthen berm and greatly reduce the potential for an uncontrolled release of water and sediment. These costs were discussed and derived with a local contractor and verified by comparison to previous projects.

3.2 DAM MODIFICATION FOR FISH PASSAGE

Cost estimates are provided in Attachment 2 for the modification of the Union Street, Sabin, and Boardman Dams for fish passage. For each dam an “expected” and “high” cost is provided. The “expected” cost is the cost estimated using unit costs and conceptual level understanding of the measure. The “high” cost is an estimate of costs if the worst case assumptions prove to be correct. This could include increases in material costs, difficulty with access, identification of risks associated with modifying the dams (for example, piping, seepage, etc. that would preclude construction near the earthen or

concrete structures). The "high" cost estimate was developed by increasing the "expected" costs by an additional 25 percent.

3.2.1 Union Street Dam

The following measures were considered for fish passage at the Union Street dam:

- Trap and transfer operation at the MDNR fish weir with modifications to the Union Street dam to allow downstream passage.
- Integration of the sturgeon lift and sort station along with the fish weir facility and rock ramp.
- New sturgeon lift and sort facility

A concept level cost and feasibility analysis concluded that the construction of lift and sort facilities would entail excessive cost and potential issues making it logistically infeasible, therefore, only the trap and transfer measure was carried forward for further analysis. The trap and transfer operation would involve trapping sturgeon at the existing weir facility and manually transferring them to upstream locations. Downstream passage would be accomplished by modifying the existing dam to be more conducive to passing adult sturgeon through the auxiliary spillway.

The fish lift for the weir is conceptualized as a hoist system capable of lifting 4 tons 10 feet vertically. This system would be attached to the loading dock wall at the fish weir. The 4-foot by 8-foot loading platform would be flat to facilitate the loading of temporary bins for placement of fish and water. The bins would be attached to the lifting platform via straps. The lift would raise the bins to the loading dock area where they would be transferred to trucks for transfer to an upstream location. Operational constraints in the form of a sturgeon specific "standard operating procedure" would be developed to limit mortality to adult sturgeon and other fish species present during the trap and transfer activities.

3.2.2 Sabin and Boardman Dams

The fish passage measure comprises two components. Upstream passage consisting of a fish lift and downstream passage consisting of a nature like channel. The fish lift consists of a crane or hoist system capable of lifting 6 tons to the top of the dam and a channel structure that discharges fish from the lift into the impoundment. The fish lift is supported within an open steel beam structure and the concrete channel spans from the top of this structure to the impoundment. Downstream passage would consist of a concrete channel with natural material added for the bed being built along the valley wall to maintain a consistent slope and sub-critical water depth.

The cost of the fish lift equipment was determined from vendor quotes and the steel beam tower structure and concrete channel by an Engineer's estimate. The natural like channel costs were calculated using unit cost breakdown for concrete, excavation, and other

material. Unit costs were derived from contractor quotes and previous projects. The primary costs associated with upstream passage would be the steel beam tower and elevated concrete discharge channel. Downstream fish passage costs would mainly be from excavation and concrete costs. Access along the valley walls for the downstream passage and to below the dam structures would be a complicating factor for this measure and would likely increase construction costs.

The fish lifts for the Sabin and Boardman Dams are more complicated structures because of the greater height of lift required and the need to span the length from the tailrace of the dam to the impoundment. Therefore, the fish lifts for Sabin and Boardman would include an open steel beam structure connected to a channel that spans from the impoundment to the top of the steel beam structure. Table 3-1 reports the physical characteristics of the fish lift structures for the Union Street, Sabin, and Boardman Dams.

Table 3-1: Physical Characteristics of Upstream Fish Passage Structures

Dam	Height of Lift (feet)	Length of Span (feet)	Structure Description
Union	10	0	Minimal changes to structure needed
Sabin	40	80	Steel tower and partially elevated channel required
Boardman	70	160	Steel tower and partially elevated channel required

Structural components of the upstream fish passages are presented in Table 3-2.

Table 3-2: Upstream Fish Passage Details for the Union Street, Sabin, and Boardman Dams

Structural Component	Dam		
	Fish Weir @ Union St.	Sabin	Boardman
Dam height (feet)	10	30	60
Steel structure height (feet)	20	50	80
# of "floors"	2	4	6
Floor width (feet)	4	20	20
Floor length (feet)	8	10	10
Total floor area (square feet)	32	800	1200
Total steel weight (tons)	0.32	8	12
Footing length (feet)	0	22	22
Footing width (feet)	0	12	12
Footing depth (feet)	0	3	3
Footing concrete volume (cubic yards)	0	29	29
Tremie length (feet)	0	25	25
Tremie width (feet)	0	15	15
Tremie depth (feet)	0	7	10
Tremie concrete volume (cubic yards)	0	97	139
# of piles	0	12	12
Length of piles (feet)	0	50	60
Total pile length (feet)	0	600	720
Sluiceway length (feet)	0	80	160
Sluiceway length on grade (feet)	0	0	70
Sluiceway width (feet)	0	12	12
Barrier width (feet)	0	1	1
Barrier height (feet)	0	5	5
Slab thickness (inches)	0	24	24
Sluiceway concrete volume (cubic yards)	0	101	201
# piers	0	5	6
Cap length (feet)	0	12	12
Cap width (feet)	0	5	5
Cap depth (feet)	0	5	5
Column height (feet)	0	25	55
Column width (feet)	0	6	8
Column depth (feet)	0	4.5	4.5
Footing length (feet)	0	8	10
Footing width (feet)	0	6.5	6.5

Structural Component	Dam		
	Fish Weir @ Union St.	**Sabin**	**Boardman**
Footing depth (feet)	0	4	4
Tremie length (feet)	0	11	13
Tremie width (feet)	0	9.5	9.5
Tremie depth (feet)	0	7	10
Pier concrete volume (cubic yards)	0	219	564
Tremie concrete volume (cubic yards)	0	135	274
# of piles per column	0	6	6
Length of piles (feet)	0	50	60
Total pile length (feet)	0	1500	2160

4 DEVELOPMENT OF ALTERNATIVES

The dam removal and fish passage measures, as described above, were evaluated during a preliminary screening. A few measures were eliminated from further consideration and the remaining measures were combined to create alternatives.

The preliminary screening evaluated the measures and eliminated measures that did not meet the objectives of the study or were not cost effective. In accordance with the U.S. Fish and Wildlife Service desire to retain the Union Street Dam as a lamprey barrier, the removal of Union Street Dam was not considered further. Since modification of the Sabin Dam and Boardman Dams is costly, provides minimal habitat benefits, and does not meet the objectives of the project, these measures and the associated alternatives were removed from further consideration. Moreover, the cost to modify the Sabin Dam is more expensive than removal and the cost to modify Boardman Dam is nearly the same cost as removal.

After three measures were eliminated during the preliminary screening, the remaining measures were combined to create alternatives. The preliminary screening resulted in eight alternatives carried forward for further analysis, displayed in Table 4-1 below.

Table 4-1: Alternatives Selected for Further Analysis

Alternative	Union Street Dam	Sabin Dam	Boardman Dam
Alternative 1	No Action	No Action	No Action
Alternative 2	Modify	No Action	No Action
Alternative 3	Modify	Remove	No Action
Alternative 4	Modify	No Action	Remove
Alternative 5	Modify	Remove	Remove
Alternative 6	No Action	Remove	No Action
Alternative 7	No Action	No Action	Remove
Alternative 8	No Action	Remove	Remove

Summarized below is the final array of alternative plans that were screened for further evaluation to determine the alternative that best fit the selection criteria.

4.1 ALTERNATIVE 1 – NO ACTION

Alternative 1 (No Action Alternative) consists of retaining and maintaining all of the dams, powerhouses, and spillways. No measures would be implemented to restore or improve coldwater habitat. Water levels and impoundment sizes would not change. The dams would not be modified to allow increased fish passage. The fish ladder at the Union Street Dam would be maintained, along with the MDNR Boardman River fish weir. The No Action Alternative is included in the analysis to provide a baseline against which the beneficial and adverse impacts of the with-project alternatives may be compared.

4.2 ALTERNATIVE 2 – MODIFY UNION STREET DAM

Alternative 2 consists of modifying the Union Street Dam to improve fish passage with the establishment of a trap-and-transfer operation at the MDNR Boardman River fish weir. It would provide spawning and foraging habitat in Boardman Lake and the Boardman River up to Sabin Dam for lake sturgeon that were manually transferred past the weir/dam. The dam and existing fish ladder would remain in place to maintain the current Boardman Lake level, but downstream passage would be improved through the dam's auxiliary spillway. The Sabin Dam would be maintained as it currently exists. The Boardman Dam would be retained and the pool elevation would remain lowered to meet the Dam Safety Act requirements of the MDEQ.

4.3 ALTERNATIVE 3 – MODIFY UNION STREET DAM, REMOVE SABIN DAM

Alternative 3 consists of modifying the Union Street Dam to improve fish passage with the establishment of a trap-and-transfer operation at the MDNR Boardman River fish

weir. The dam and existing fish ladder would remain in place to maintain the current Boardman Lake level, but downstream passage would be improved through the dam's auxiliary spillway. The Sabin Dam would be removed to allow a free-flowing river to be restored from the Boardman Dam to Boardman Lake. The Sabin Dam would be breached in the area of the auxiliary spillway. In this area the river and floodplain would be designed. All other parts of the dam (i.e. the powerhouses and other portions of the earthen embankment) would remain in place. The proposed river alignment would include engineered riffles/grade control structures at the former Sabin Dam location that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at this location to redirect the channel and protect stream banks. The Boardman Dam would be retained and the pool elevation would remain lowered to meet the Dam Safety Act requirements of the MDEQ.

4.4 ALTERNATIVE 4 – MODIFY UNION STREET DAM, REMOVE BOARDMAN DAM

Alternative 4 consists of modifying the Union Street Dam to improve fish passage with the establishment of a trap-and-transfer operation at the MDNR Boardman River fish weir. The dam and existing fish ladder would remain in place to maintain the current Boardman Lake level, but downstream passage would be improved through the dam's auxiliary spillway. The Sabin Dam would be maintained as it currently exists. The Boardman Dam would be removed and Boardman Pond would return to a more natural riverine state. The proposed river alignment would include engineered riffles/grade control structures at the former location of the Boardman Dam that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at this location to redirect the channel and protect stream banks. The bridge and road construction project required as a result of moving the river channel is being undertaken by the Grand Traverse County Road Commission and is not part of the USACE Ecosystem Restoration Project.

4.5 ALTERNATIVE 5 – MODIFY UNION STREET DAM, REMOVE SABIN AND BOARDMAN DAMS

Alternative 5 consists of modifying the Union Street Dam to improve fish passage with the establishment of a trap-and-transfer operation at the MDNR Boardman River fish weir. The dam and existing fish ladder would remain in place to maintain the current Boardman Lake level, but downstream passage would be improved through the dam's auxiliary spillway. The Sabin Dam and the Boardman Dam would be removed to allow a free-flowing river to be restored from the Boardman Pond to Boardman Lake. The dams would be breached in the location of the historic channel. In this area the river and floodplain would be designed. All other parts of the dam (i.e. the powerhouses and other portions of the earthen embankment) would remain in place. The proposed river alignment would include engineered riffle/grade control structures at both dams that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at the dams to

redirect the channel and protect stream banks. The bridge and road construction project required as a result of moving the river channel is being undertaken by the Grand Traverse County Road Commission and is not part of the USACE Ecosystem Restoration Project.

4.6 ALTERNATIVE 6 – REMOVE SABIN DAM

Alternative 6 consists of retaining the Union Street Dam, along with the existing fish ladder and fish weir operation. The current fish ladder operation would continue. The Sabin Dam would be removed to allow a free-flowing river to be restored from the Boardman Pond Dam to Boardman Lake. The Sabin Dam would be breached in the area of the auxiliary spillway. In this area the river and floodplain would be designed. All other parts of the dam (i.e. the powerhouses and other portions of the earthen embankment) would remain in place. The proposed river alignment would include engineered riffles/grade control structures at the Sabin Dam that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at the former Sabin Dam location to redirect the channel and protect stream banks. The Boardman Dam would be retained and the pool elevation would remain lowered to meet the Dam Safety Act requirements of the MDEQ.

4.7 ALTERNATIVE 7 – REMOVE BOARDMAN DAM

Alternative 7 consists of retaining the Union Street Dam, along with the existing fish ladder and fish weir operation. The Sabin Dam would be maintained as it currently exists. The Boardman Dam would be removed and Boardman Pond would return to a more natural riverine state. The Boardman dam would be breached through the earthen embankment in the location of the historic channel. In this area the river and floodplain would be designed. All other parts of the dam (i.e. the powerhouses and other portions of the earthen embankment) would remain in place. The proposed river alignment would include engineered riffles/grade control structures at the former Boardman Dam location that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at this location to redirect the channel and protect stream banks. The bridge and road construction project required as a result of moving the river channel is being undertaken by the Grand Traverse County Road Commission and is not part of the USACE Ecosystem Restoration Project.

4.8 ALTERNATIVE 8 – REMOVE SABIN AND BOARDMAN DAMS

Alternative 8 consists of retaining the Union Street Dam, along with the existing fish ladder and fish weir operation. The Sabin Dam and Boardman Dam would be removed to allow a free-flowing river to be restored from the Boardman Pond to Boardman Lake. The dams would be breached in the location of the historic channel. In this area the river and floodplain would be designed. All other parts of the dam (i.e. the powerhouses and

other portions of the earthen embankment) would remain in place. The proposed river alignment would include engineered riffle/grade control structures at both dams that would add stability to the restored channel in areas of relatively steep slopes. In addition to engineered rock riffles, other bank stabilization measures might be used at the dams to redirect the channel and protect stream banks. The bridge and road construction project required as a result of moving the river channel is being undertaken by the Grand Traverse County Road Commission and is not part of the USACE Ecosystem Restoration Project.

The cost of each alternative, developed from the combined cost of individual measures is presented in Attachment 3.

First and annual costs for the alternative plans are presented in Table 4-2.

Table 4-2: Alternative Cost Summary

Alternative	Union Street Dam	Sabin Dam	Boardman Dam	First Cost	Net Avg. Annual Cost*
Alternative 1	No Action	No Action	No Action	$0	$0
Alternative 2	Modify	No Action	No Action	$695,000	$14,400
Alternative 3	Modify	Remove	No Action	$3,294,400	$105,200
Alternative 4	Modify	No Action	Remove	$6,620,700	$248,100
Alternative 5	Modify	Remove	Remove	$9,210,100	$338,400
Alternative 6	No Action	Remove	No Action	$2,599,400	$92,000
Alternative 7	No Action	No Action	Remove	$5,925,800	$234,800
Alternative 8	No Action	Remove	Remove	$8,515,200	$325,200

* - Net Average Annual Costs (AACs) are presented in detail in the Economics Appendix. The AACs include real estate, construction, engineering, administration, contingency, interest during construction, present value of monitoring costs and present value of OMRR&R. AACs were calculated using the FY14 Federal discount rate of 3.50 percent and a 50-year period of analysis. All costs are in 2012 dollars and were rounded to the nearest hundred.

5 PLAN SELECTION

A detailed discussion evaluating all final alternatives is included in the DPR under Section 4.6, "Evaluation of Alternative Plans." The selected alternative provides the highest net benefits, and meets the formulation and evaluation criteria of being technically effective, environmentally sound, socially/politically acceptable, cost effective (implementation cost, and operation and maintenance cost), and constructible.

As such, the selected plan is Alternative 5 – Modify Union Street Dam and Remove Sabin and Boardman Dams. A detailed description of the selected plan is included in the DPR Section 5, "Selected Plan."

6 COST ESTIMATING METHODOLOGY

Construction quantities shown in the Engineering Appendix (Appendix A) were used for the Detailed Cost Estimate. Additional quantities and features developed for the selected plan were computed by cost engineering personnel and included in the cost estimate. The quantities are substantially complete regarding biddability, constructability, and operability of the selected plan.

Guidance for the preparation of the estimate and attachments was obtained from ER 1110-2-1150, *Engineering and Design for Civil Works Projects*; ER 1110-2-1302 *Civil Works Cost Engineering*; ETL 1110-2-573, *Construction Cost Estimating Guide for Civil Works*; and EM 1110-2-1304, *Civil Works Construction Cost Index System (CWCCIS)*. The estimate was prepared using the MII version 4.1 software.

7 SELECTED ALTERNATIVE

7.1 PRICE LEVEL

Project costs are based on MII 2010 English Cost Book prices, unless otherwise noted. Equipment rates were based on the MII 2011 Region 2 equipment cost library. Labor rates were updated using the current Davis Bacon rates, including fringes from MI 130037, dated January 4, 2013, for Grand Traverse County, MI. Fuel rates were updated for the Midwest as of February 4, 2013. The price for off-road diesel was computed by subtracting State and Federal taxes from retail diesel prices. Michigan sales tax of 6 percent was applied to materials.

7.2 QUANTITIES

Costs are based on quantities developed from the design plans presented in the Engineering Appendix. Earthwork volume load/swell factors used in the MII estimate are based on average values from RSMeans Heavy Construction Handbook (bank cubic yard x 1.2 = loose cubic yard).

7.3 MARKUPS

Markups were developed for the cost estimate as follows:

- The work was assumed to be completed on a 6-day, 10-hour/day work week. Work associated with dam breaching was assumed to be completed on a 7-day, 12-hour day basis.
- Contractor markups (job office overhead, home office overhead, profit, and bonds) were based on markups used on similar projects:

- Job Office Overhead (JOOH) for the prime contractor includes itemized equipment and personnel needed to accomplish supervision and support tasks.
- An additional 2 percent of labor was added for small tools and to cover miscellaneous field overhead costs.
- Home Office Overhead (HOOH) for the prime contractor includes general and administrative costs. HOOH was set at 13 percent of the running cost to prime.
- JOOH for the subcontractors includes itemized equipment and field trailers.
- Profit was established on a weighted guideline percentage for both prime and subcontractors.
- Bond costs were based on bond tables for Class B. The prime contractor's bond covers work by the subcontractors.

7.4 PED AND CONSTRUCTION MANAGEMENT

The cost for planning, engineering, and design (PED) was assumed to be 17.8 percent of the construction contract cost (3 percent for planning after the Feasibility Study and 14.8 percent for engineering design and engineering during construction). The cost for construction management was set at 8.9 percent of the contract cost based on general estimates from past experience. The PED costs include soil sampling and analysis for the Sabin and Boardman dam sediments, to be conducted during the PED. Construction management includes environmental compliance monitoring to be complete following construction.

8 SCHEDULE

A timeline for implementing the major components of the selected plan is presented in Attachment 4. The construction schedule is dependent on several factors that include, but are not limited to, the availability of funding, acquisition of temporary and permanent easements, market forces in the construction industry, such as the availability of experienced contractors and labor forces, and availability of agency approvals and permits. The funding stream is important throughout the design and construction phases of the project. The schedule shown assumes that both Federal and local funding would be available to support design and construction.

Assuming Final LDR approval in the 3rd quarter of FY 2014, the PED phase would begin immediately. A 12-month PED period is anticipated. Following development of the plans and specifications, a Design Documentation Report (DDR) would be prepared and reviewed. Easement acquisition and utility relocations would begin upon acceptance of the DDR, and are expected to be completed by the 1st quarter of FY 2016. Bidding and award of a construction contract is expected in the 2nd quarter of FY 2016. Mobilization and construction could begin in early 2016. A construction duration of 12 months is anticipated, with project closeout in early 2017.

The project is likely to be completed as a single construction contract.

9 COST AND SCHEDULE RISK ANALYSIS

Guidance from ER 1110-2-1302, *Civil Works for Cost Engineering*, indicates that construction feature contingencies for a Class 3 (Pre-Authorization Alternative Study) level estimate should be between 20 percent and 60 percent. An Abbreviated Risk Analysis by the Project Delivery Team was conducted to establish the application of contingencies to properly weigh the uncertainties associated with each major construction cost item. The Total Project Cost Summary, described in Section 10, includes the contingencies established through the Cost and Schedule Risk Analysis process. The Abbreviated Risk Analysis documentation is located in Attachment 5.

10 TOTAL PROJECT COST SUMMARY

The Total Project Cost Summary (TPCS) for the fully funded project was developed by adding the contingency amounts (discussed above) to the initial costs, and then escalating those costs to the midpoint of design and construction for the major components based on the project schedule. The midpoint for PED is 1st quarter FY 2015. The construction midpoint was assumed to occur in the 4th quarter of FY 2016.

The Total Project Cost of the fully-funded project is $13,223,000, as shown on Table 10-1.

Table 10-1: Estimated Total Project Cost

WBS No.	Description	Fully Funded Cost
01	Lands and Damages	$127,000
06	Fish and Wildlife Facilities	$10,209,000
30	Planning, Engineering and Design	$1,882,000
31	Construction Management	$1,005,000
	Estimated Total Project Cost	**$13,223,000**
22	Feasibility Study	$2,000,000

The base cost sharing for this project between the Federal and non-Federal partner is 65%/35%. The first $100,000 of the feasibility study cost is Federally funded, with the remaining portion also cost shared at 65%/35%. The TPCS is presented in Attachment 6.

The MII cost estimate is presented in Attachment 7. Design details and quantity documentation are presented in Attachment 8.

ATTACHMENT 1

DAM REMOVAL/BREACH MEASURES

Conceptual River Restoration Boardman River - Sabin Dam
Dam Removal / Breach Measures
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
EARTHWORKS AND SITE PREPARATION					
1.	Site Clearing	5	AC	$ 7,500	$ 37,500
2.	Channel Bottom Dredging	200	CY	$ 15	$ 3,000
3.	Floodplain and Dry Channel Excavation	26800	CY	$ 10	$ 268,000
4.	Dam Excavation	20000	CY	$ 8	$ 160,000
5.	Embankment Earth (Engineered Fill)	0	CY	$ 5	$ -
6.	Topsoil (salvaged)	20	AC	$ 7,000	$ 140,000
7.	Topsoil (furnished)	0	AC	$ 14,000	$ -
8.	Sediment Trap Cleaning	47800	CY	$ 10	$ 478,000
STREAM RESTORATION					
9.	Bank Stabilization (As Needed)	600	LF	$ 50	$ 30,000
10.	Rock Cross Vanes		CY	$ 90	$ -
11.	Rock W Weirs		CY	$ 90	$ -
12.	J Hook Vanes		CY	$ 90	$ -
13.	Engineered Riffle	1340	SY	$ 50	$ 67,000
DAM REMOVAL					
13.	Breach Dam	1	Lump Sum	$ 100,000	$ 100,000
14.	Remove Spillway	1	Lump Sum	$ 150,000	$ 150,000
INCIDENTAL CONSTRUCTION AND REVEGETATION					
15.	Construction Office	4	Month	$ 750	$ 3,000
16.	Temporary Construction Entrance	1	EA	$ 2,000	$ 2,000
17.	Temporary Stream Crossing / Ford	2	EA	$ 3,000	$ 6,000
18.	Temporary Haul Road	8000	LF	$ 20	$ 160,000
17.	Erosion Control	10000	SY	$ 5	$ 50,000
18.	Temporary Seeding	5	AC	$ 125	$ 625
19.	Permanent Seeding	10	AC	$ 1,500	$ 15,000
20.	Live Staking and Plantings	1	AC	$ 12,000	$ 12,000
21.	Signage	1	Lump Sum	$ 5,500	$ 5,500
	Total Construction Cost				**$ 1,687,625**
	Estimated Engineering Costs (20%)				$ 337,525
	Estimated Administration Costs (5%)				$ 84,381
	Subtotal Project Cost				**$ 2,109,531**
	Contingency (20%)				$ 421,906
	Easements and Acquisitions				$ 32,988
	Total Estimated Project Cost				**$ 2,564,426**

Conceptual River Restoration Boardman River - Boardman Dam
Dam Removal / Breach Measures
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
EARTHWORKS AND SITE PREPARATION					
1.	Site Clearing	5	AC	$ 7,500	$ 37,500
2.	Channel Bottom Dredging	1000	CY	$ 15	$ 15,000
3.	Floodplain and Dry Channel Excavation	42400	CY	$ 10	$ 424,000
4.	Road & Dam Excavation	58400	CY	$ 8	$ 467,200
5.	Embankment Earth (Fill for Cass Rd and Bridge)	20000	CY	$ 5	$ 100,000
6.	2" Topsoil (salvaged)	50	AC	$ 7,000	$ 350,000
7.	6" Topsoil (furnished)	0	AC	$ 14,000	$ -
8.	Sediment Trap Cleaning	85600	CY	$ 10	$ 856,000
STREAM RESTORATION					
9.	Bank Stabilization (As Needed)	1000	LF	$ 50	$ 50,000
10.	Rock Cross Vanes	0	CY	$ 90	$ -
11.	Rock W Weirs	0	CY	$ 90	$ -
12.	Step Pools	0	CY	$ 90	$ -
13.	J Hook Vanes	0	CY	$ 90	$ -
14.	Engineered Riffle	1340	SY	$ 50	$ 67,000
DAM REMOVAL					
15.	Breach Embankment	1	Lump Sum	$ 790,000	$ 790,000
	Breaching Operation	$ 100,000			
	Core Wall Demo	$ 60,000			
	ArmorFlex Matting (as needed)	$ 130,000			
	Bypass Pumping	$ 500,000			
16.	Remove Powerhouse and appurtenances	0	Lump Sum	$ 680,000	$ -
INCIDENTAL CONSTRUCTION AND REVEGETATION					
17.	Construction Office	4	Month	$ 750	$ 3,000
18.	Temporary Construction Entrance	1	EA	$ 2,000	$ 2,000
19.	Temporary Stream Crossing / Ford	2	EA	$ 3,000	$ 6,000
20.	Temporary Haul Road	10000	LF	$ 20	$ 200,000
21.	Erosion Control	20000	SY	$ 5	$ 100,000
22.	Temporary Seeding	10	AC	$ 125	$ 1,250
23.	Permanent Seeding	25	AC	$ 1,500	$ 37,500
24.	Live Staking and Plantings	2	AC	$ 12,000	$ 24,000
25.	Signage	1	Lump Sum	$ 5,500	$ 5,500
	Total Construction Cost				**$ 3,535,950**
	Estimated Engineering Costs (20%)				$ 707,190
	Estimated Administration Costs (5%)				$ 176,798
	Subtotal Project Cost				**$ 4,419,938**
	Contingency (20%)				$ 1,319,966
	Easements and Acquisitions				$ 61,804
	Total Estimated Project Cost				**$ 5,801,708**

ATTACHMENT 2

DAM MODIFICATION FOR FISH PASSAGE MEASURES

Conceptual River Restoration Boardman River - Union Street Dam
Dam Modification For Fish Passage Measures
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
DOWNSTREAM FISH PASSAGE							
1.	Demolition of Existing Auxillary Spillway	200	CY	$	60	$	12,000
2.	Structural Concrete / cast in place	200	CY	$	500	$	100,000
3.	48" Culvert	300	LF	$	200	$	60,000
4.	Gate	1	EA	$	50,000	$	50,000
5.	Earthworks	1500	CY	$	10	$	15,000
6.	Site Clearing	0.5	AC	$	7,500	$	3,750
7.	Fencing / Railings	60	LF	$	15	$	900
UPSTREAM FISH PASSAGE							
8.	Steel Framing	0.32	Tons	$	5,000	$	1,600
9.	Metal Deck	32	SF	$	25	$	800
10.	Mechanical Lift	1	LS	$	170,000	$	170,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
11.	Construction Office	4	Month	$	750	$	3,000
12.	Temporary Construction Entrance	2	EA	$	2,000	$	4,000
13.	Temporary Sheet Piling	720	SF	$	25	$	18,000
14.	Sheet Pile Mobilization	1	LS	$	10,000	$	10,000
15.	Erosion Control	0.5	AC	$	2,000	$	1,000
16.	6" Topsoil (furnished)	0.5	AC	$	7,000	$	3,500
17.	Seeding and Restoration	0.5	AC	$	1,500	$	750
18.	Signage	1	Lump Sum	$	5,500	$	5,500
	Total Construction Cost					**$**	**459,800**
	Estimated Engineering Costs (20%)					$	91,960
	Estimated Administration Costs (5%)					$	22,990
	Subtotal Project Cost					**$**	**574,750**
	Contingency (20%)					$	114,950
	Easements and Acquisitions					$	5,208
	Total Estimated Project Cost					**$**	**694,908**

Conceptual River Restoration Boardman River - Sabin Dam
Dam Modification For Fish Passage Measures
Date: 7/2/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
DOWNSTREAM FISH PASSAGE							
1.	Site Clearing	3.2	AC	$	7,500	$	24,000
2.	Structural Concrete / cast in place	3750	CY	$	500	$	1,875,000
3.	Natural Substrate (various sized cobble)	695	CY	$	30	$	20,850
4.	Gate	1	EA	$	50,000	$	50,000
5.	Earthworks	36300	CY	$	10	$	363,000
6.	Fencing / Railings	2500	LF	$	15	$	37,500
UPSTREAM PASSAGE - FISH ELEVATOR							
7.	Steel Framing	8	Tons	$	5,000	$	40,000
8.	Metal Decking	800	SF	$	25	$	20,000
9.	Structural Concrete	29	CY	$	650	$	18,850
9.	Tremie Concrete	97	CY	$	200	$	19,400
10.	Foundation Piles	600	LF	$	50	$	30,000
11.	Cofferdam	1	Lump Sum	$	100,000	$	100,000
12.	Mechanical Lift	1	Lump Sum	$	180,000	$	180,000
UPSTREAM PASSAGE - SLUICEWAY							
13.	Structural Concrete	320	CY	$	650	$	208,000
14.	Tremie Concrete	135	CY	$	200	$	27,000
15.	Foundation Piles	1500	LF	$	50	$	75,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
16.	Construction Office	4	Month	$	750	$	3,000
17.	Temporary Construction Entrance	1	EA	$	2,000	$	2,000
18.	Pile Driving Mobilization	1	Lump Sum	$	10,000	$	10,000
19.	Erosion Control	4	AC	$	2,000	$	8,000
20.	Seeding and Restoration	4	AC	$	1,500	$	6,000
21.	Signage	1	Lump Sum	$	5,500	$	5,500
	Total Construction Cost					**$**	**3,123,100**
	Estimated Engineering Costs (20%)					$	624,620
	Estimated Administration Costs (5%)					$	156,155
	Subtotal Project Cost					**$**	**3,903,875**
	Contingency (20%)					$	780,775
	Easements and Acquisitions					$	8,250
	Total Estimated Project Cost					**$**	**4,692,900**

Conceptual River Restoration Boardman River - Boardman Dam
Dam Modification For Fish Passage Measures
Date: 7/2/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
DOWNSTREAM FISH PASSAGE					
1.	Site Clearing	4	AC	$ 7,500	$ 30,000
2.	Structural Concrete / cast in place	7875	CY	$ 500	$ 3,937,500
3.	Natural Substrate (various sized cobble)	1170	CY	$ 30	$ 35,100
4.	Gate	1	EA	$ 50,000	$ 50,000
5.	Earthworks	60980	CY	$ 10	$ 609,800
6.	Fencing / Railings	4200	LF	$ 15	$ 63,000
7.	Cass Road Culvert	1	Lump Sum	$ 300,000	$ 300,000
UPSTREAM PASSAGE - FISH ELEVATOR					
8.	Steel Framing	12	Tons	$ 5,000	$ 60,000
9.	Metal Decking	1200	SF	$ 25	$ 30,000
10.	Structural Concrete	29	CY	$ 650	$ 18,850
10.	Tremie Concrete	139	CY	$ 200	$ 27,800
11.	Foundation Piles	720	LF	$ 50	$ 36,000
12.	Cofferdam	1	Lump Sum	$ 100,000	$ 100,000
13.	Mechanical Lift	1	Lump Sum	$ 210,000	$ 210,000
UPSTREAM PASSAGE - SLUICEWAY					
14.	Structural Concrete	766	CY	$ 650	$ 497,900
15.	Tremie Concrete	274	CY	$ 200	$ 54,800
16.	Foundation Piles	2160	LF	$ 50	$ 108,000
INCIDENTAL CONSTRUCTION AND REVEGETATION					
17.	Construction Office	4	Month	$ 750	$ 3,000
18.	Temporary Construction Entrance	1	EA	$ 2,000	$ 2,000
19.	Pile Driving Mobilization	1	Lump Sum	$ 10,000	$ 10,000
20.	Erosion Control	4	AC	$ 2,000	$ 8,000
21.	Seeding and Restoration	4	AC	$ 1,500	$ 6,000
22.	Signage	1	Lump Sum	$ 5,500	$ 5,500
	Total Construction Cost				**$ 6,203,250**
	Estimated Engineering Costs (20%)				$ 1,240,650
	Estimated Administration Costs (5%)				$ 310,163
	Subtotal Project Cost				**$ 7,754,063**
	Contingency (20%)				$ 1,550,813
	Easements and Acquisitions				$ 15,500
	Total Estimated Project Cost				**$ 9,320,375**

ATTACHMENT 3

SCREENING LEVEL COST ESTIMATES

Conceptual River Restoration Boardman River
Alternative 2: Modify Union Street / No Action at Sabin or Boardman Dams
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
DOWNSTREAM FISH PASSAGE					
1.	Demolition of Existing Auxillary Spillway	200	CY	$ 60	$ 12,000
2.	Structural Concrete / cast in place	200	CY	$ 500	$ 100,000
3.	48" Culvert	300	LF	$ 200	$ 60,000
4.	Gate	1	EA	$ 50,000	$ 50,000
5.	Earthworks	1500	CY	$ 10	$ 15,000
6.	Site Clearing	0.5	AC	$ 7,500	$ 3,750
7.	Fencing / Railings	60	LF	$ 15	$ 900
UPSTREAM FISH PASSAGE					
8.	Steel Framing	0.32	Tons	$ 5,000	$ 1,600
9.	Metal Deck	32	SF	$ 25	$ 800
10.	Mechanical Lift	1	LS	$ 170,000	$ 170,000
INCIDENTAL CONSTRUCTION AND REVEGETATION					
11.	Construction Office	4	Month	$ 750	$ 3,000
12.	Temporary Construction Entrance	2	EA	$ 2,000	$ 4,000
13.	Temporary Sheet Piling	720	SF	$ 25	$ 18,000
14.	Sheet Pile Mobilization	1	LS	$ 10,000	$ 10,000
15.	Erosion Control	0.5	AC	$ 2,000	$ 1,000
16.	6" Topsoil (furnished)	0.5	AC	$ 7,000	$ 3,500
17.	Seeding and Restoration	0.5	AC	$ 1,500	$ 750
18.	Signage	1	Lump Sum	$ 5,500	$ 5,500

Total Construction Cost	**$ 459,800**
Estimated Engineering Costs (20%)	$ 92,000
Estimated Administration Costs (5%)	$ 23,000
Subtotal Project Cost	**$ 574,800**
Contingency (20%)	$ 115,000
Easements and Acquisitions	$ 5,200
Total Estimated Project Cost	**$ 695,000**

Conceptual River Restoration Boardman River
Alternative 3: Modify Union St. Dam / Remove Sabin Dam / No Action at Boardman Dam
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
Union Street Dam					
DOWNSTREAM FISH PASSAGE					
1.	Demolition of Existing Auxillary Spillway	200	CY	$ 60	$ 12,000
2.	Structural Concrete / cast in place	200	CY	$ 500	$ 100,000
3.	48" Culvert	300	LF	$ 200	$ 60,000
4.	Gate	1	EA	$ 50,000	$ 50,000
5.	Earthworks	1500	CY	$ 10	$ 15,000
6.	Site Clearing	0.5	AC	$ 7,500	$ 3,750
7.	Fencing / Railings	60	LF	$ 15	$ 900
UPSTREAM FISH PASSAGE					
8.	Steel Framing	0.32	Tons	$ 5,000	$ 1,600
9.	Metal Deck	32	SF	$ 25	$ 800
10.	Mechanical Lift	1	LS	$ 170,000	$ 170,000
INCIDENTAL CONSTRUCTION AND REVEGETATION					
11.	Construction Office	4	Month	$ 750	$ 3,000
12.	Temporary Construction Entrance	2	EA	$ 2,000	$ 4,000
13.	Temporary Sheet Piling	720	SF	$ 25	$ 18,000
14.	Sheet Pile Mobilization	1	LS	$ 10,000	$ 10,000
15.	Erosion Control	0.5	AC	$ 2,000	$ 1,000
16.	6" Topsoil (furnished)	0.5	AC	$ 7,000	$ 3,500
17.	Seeding and Restoration	0.5	AC	$ 1,500	$ 750
18.	Signage	1	Lump Sum	$ 5,500	$ 5,500
Sabin					
EARTHWORKS AND SITE PREPARATION					
1.	Site Clearing	5	AC	$ 7,500	$ 37,500
2.	Channel Bottom Dredging	200	CY	$ 15	$ 3,000
3.	Floodplain and Dry Channel Excavation	26800	CY	$ 10	$ 268,000
4.	Dam Excavation	20000	CY	$ 8	$ 160,000
5.	Embankment Earth (Engineered Fill)	0	CY	$ 5	$ -
6.	Topsoil (salvaged)	20	AC	$ 7,000	$ 140,000
7.	Topsoil (furnished)	0	AC	$ 14,000	$ -
8.	Sediment Trap Cleaning	47800	CY	$ 10	$ 478,000
STREAM RESTORATION					
9.	Bank Stabilization (As Needed)	600	LF	$ 50	$ 30,000
10.	Rock Cross Vanes		CY	$ 90	$ -
11.	Rock W Weirs		CY	$ 90	$ -
12.	J Hook Vanes		CY	$ 90	$ -
13.	Engineered Riffle	1340	SY	$ 50	$ 67,000
DAM REMOVAL					
13.	Breach Dam	1	Lump Sum	$ 100,000	$ 100,000
14.	Remove Spillway	1	Lump Sum	$ 150,000	$ 150,000
INCIDENTAL CONSTRUCTION AND REVEGETATION					
15.	Construction Office	4	Month	$ 750	$ 3,000
16.	Temporary Construction Entrance	1	EA	$ 2,000	$ 2,000
17.	Temporary Stream Crossing / Ford	2	EA	$ 3,000	$ 6,000
18.	Temporary Haul Road	8000	LF	$ 20	$ 160,000
17.	Erosion Control	10000	SY	$ 5	$ 50,000
18.	Temporary Seeding	5	AC	$ 125	$ 625
19.	Permanent Seeding	10	AC	$ 1,500	$ 15,000
20.	Live Staking and Plantings	1	AC	$ 12,000	$ 12,000
21.	Signage	1	Lump Sum	$ 5,500	$ 5,500

Total Construction Cost	**$ 2,147,400**
Estimated Engineering Costs (20%)	$ 429,500
Estimated Administration Costs (5%) + $35K for sampling/analysis	$ 142,400
Subtotal Project Cost	**$ 2,719,300**
Contingency (20%)	$ 536,900
Easements and Acquisitions	$ 38,200
Total Estimated Project Cost	**$ 3,294,400**

Conceptual River Restoration Boardman River
Alternative 4: Modify Union St. Dam / Remove Boardman Dam / No Action at Sabin Dam
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
Union Street Dam							
DOWNSTREAM FISH PASSAGE							
1.	Demolition of Existing Auxillary Spillway	200	CY	$	60	$	12,000
2.	Structural Concrete / cast in place	200	CY	$	500	$	100,000
3.	48" Culvert	300	LF	$	200	$	60,000
4.	Gate	1	EA	$	50,000	$	50,000
5.	Earthworks	1500	CY	$	10	$	15,000
6.	Site Clearing	0.5	AC	$	7,500	$	3,750
7.	Fencing / Railings	60	LF	$	15	$	900
UPSTREAM FISH PASSAGE							
8.	Steel Framing	0.32	Tons	$	5,000	$	1,600
9.	Metal Deck	32	SF	$	25	$	800
10.	Mechanical Lift	1	LS	$	170,000	$	170,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
11.	Construction Office	4	Month	$	750	$	3,000
12.	Temporary Construction Entrance	2	EA	$	2,000	$	4,000
13.	Temporary Sheet Piling	720	SF	$	25	$	18,000
14.	Sheet Pile Mobilization	1	LS	$	10,000	$	10,000
15.	Erosion Control	0.5	AC	$	2,000	$	1,000
16.	6" Topsoil (furnished)	0.5	AC	$	7,000	$	3,500
17.	Seeding and Restoration	0.5	AC	$	1,500	$	750
18.	Signage	1	Lump Sum	$	5,500	$	5,500
Boardman							
EARTHWORKS AND SITE PREPARATION							
1.	Site Clearing	5	AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	1000	CY	$	15	$	15,000
3.	Floodplain and Dry Channel Excavation	42400	CY	$	10	$	424,000
4.	Road & Dam Excavation	58400	CY	$	8	$	467,200
5.	Embankment Earth (Fill for Cass Rd and Bridg	20000	CY	$	5	$	100,000
6.	Topsoil (salvaged)	100	AC	$	7,000	$	700,000
7.	Topsoil (furnished)	0	AC	$	14,000	$	-
8.	Sediment Trap Cleaning	85600	CY	$	10	$	856,000

STREAM RESTORATION							
9.	Bank Stabilization (As Needed)	1000	LF	$	50	$	50,000
10.	Rock Cross Vanes	0	CY	$	90	$	-
11.	Rock W Weirs	0	CY	$	90	$	-
12.	Step Pools	0	CY	$	90	$	-
13.	J Hook Vanes	0	CY	$	90	$	-
14.	Engineered Riffle	1340	SY	$	50	$	67,000
DAM REMOVAL							
15.	Breach Embankment	1	Lump Sum	$	790,000	$	790,000
	Breaching Operation $ 100,000						
	Core Wall Demo $ 60,000						
	ArmorFlex Matting (as needed) $ 130,000						
	Bypass Pumping $ 500,000						
16.	Remove Powerhouse and appurtenances	0	Lump Sum	$	680,000	$	-
INCIDENTAL CONSTRUCTION AND REVEGETATION							
17.	Construction Office	4	Month	$	750	$	3,000
18.	Temporary Construction Entrance	1	EA	$	2,000	$	2,000
19.	Temporary Stream Crossing / Ford	2	EA	$	3,000	$	6,000
20.	Temporary Haul Road	10000	LF	$	20	$	200,000
21.	Erosion Control	20000	SY	$	5	$	100,000
22.	Temporary Seeding	10	AC	$	125	$	1,250
23.	Permanent Seeding	25	AC	$	1,500	$	37,500
24.	Live Staking and Plantings	2	AC	$	12,000	$	24,000
25.	Signage	1	Lump Sum	$	5,500	$	5,500

Total Construction Cost	**$**	**4,345,800**
Estimated Engineering Costs (20%)	$	869,200
Estimated Administration Costs (5%) + $35K for sampling/analysis	$	252,300
Subtotal Project Cost	**$**	**5,467,300**
Contingency (20%)	$	1,086,400
Easements and Acquisitions	$	67,000
Total Estimated Project Cost	**$**	**6,620,700**

Conceptual River Restoration Boardman River
Alternative 5: Modify Union St. Dam / Remove Sabin and Boardman Dams
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
Union Street Dam							
DOWNSTREAM FISH PASSAGE							
1.	Demolition of Existing Auxillary Spillway	200	CY	$	60	$	12,000
2.	Structural Concrete / cast in place	200	CY	$	500	$	100,000
3.	48" Culvert	300	LF	$	200	$	60,000
4.	Gate	1	EA	$	50,000	$	50,000
5.	Earthworks	1500	CY	$	10	$	15,000
6.	Site Clearing	0.5	AC	$	7,500	$	3,750
7.	Fencing / Railings	60	LF	$	15	$	900
UPSTREAM FISH PASSAGE							
8.	Steel Framing	0.32	Tons	$	5,000	$	1,600
9.	Metal Deck	32	SF	$	25	$	800
10.	Mechanical Lift	1	LS	$	170,000	$	170,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
11.	Construction Office	4	Month	$	750	$	3,000
12.	Temporary Construction Entrance	2	EA	$	2,000	$	4,000
13.	Temporary Sheet Piling	720	SF	$	25	$	18,000
14.	Sheet Pile Mobilization	1	LS	$	10,000	$	10,000
15.	Erosion Control	0.5	AC	$	2,000	$	1,000
16.	6" Topsoil (furnished)	0.5	AC	$	7,000	$	3,500
17.	Seeding and Restoration	0.5	AC	$	1,500	$	750
18.	Signage	1	Lump Sum	$	5,500	$	5,500
Sabin Dam							
EARTHWORKS AND SITE PREPARATION							
1.	Site Clearing	5	AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	200	CY	$	15	$	3,000
3.	Floodplain and Dry Channel Excavation	26800	CY	$	10	$	268,000
4.	Dam Excavation	20000	CY	$	8	$	160,000
5.	Embankment Earth (Engineered Fill)	0	CY	$	5	$	-
6.	Topsoil (salvaged)	20	AC	$	7,000	$	140,000
7.	Topsoil (furnished)	0	AC	$	14,000	$	-
8.	Sediment Trap Cleaning	47800	CY	$	10	$	478,000
STREAM RESTORATION							
9.	Bank Stabilization (As Needed)	600	LF	$	50	$	30,000
10.	Rock Cross Vanes		CY	$	90	$	-
11.	Rock W Weirs		CY	$	90	$	-
12.	J Hook Vanes		CY	$	90	$	-
13.	Engineered Riffle	1340	SY	$	50	$	67,000

DAM REMOVAL

13.	Breach Dam	1 Lump Sum	$	100,000	$	100,000
14.	Remove Spillway	1 Lump Sum	$	150,000	$	150,000

INCIDENTAL CONSTRUCTION AND REVEGETATION

15.	Construction Office	4 Month	$	750	$	3,000
16.	Temporary Construction Entrance	1 EA	$	2,000	$	2,000
17.	Temporary Stream Crossing / Ford	2 EA	$	3,000	$	6,000
18.	Temporary Haul Road	8000 LF	$	20	$	160,000
17.	Erosion Control	10000 SY	$	5	$	50,000
18.	Temporary Seeding	5 AC	$	125	$	625
19.	Permanent Seeding	10 AC	$	1,500	$	15,000
20.	Live Staking and Plantings	1 AC	$	12,000	$	12,000
21.	Signage	1 Lump Sum	$	5,500	$	5,500

Boardman Dam

EARTHWORKS AND SITE PREPARATION

1.	Site Clearing	5 AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	1000 CY	$	15	$	15,000
3.	Floodplain and Dry Channel Excavation	42400 CY	$	10	$	424,000
4.	Road & Dam Excavation	58400 CY	$	8	$	467,200
5.	Embankment Earth (Fill for Cass Rd and Bridg	20000 CY	$	5	$	100,000
6.	Topsoil (salvaged)	100 AC	$	7,000	$	700,000
7.	Topsoil (furnished)	0 AC	$	14,000	$	-
8.	Sediment Trap Cleaning	85600 CY	$	10	$	856,000

STREAM RESTORATION

9.	Bank Stabilization (As Needed)	1000 LF	$	50	$	50,000
10.	Rock Cross Vanes	0 CY	$	90	$	-
11.	Rock W Weirs	0 CY	$	90	$	-
12.	Step Pools	0 CY	$	90	$	-
13.	J Hook Vanes	0 CY	$	90	$	-
14.	Engineered Riffle	1340 SY	$	50	$	67,000

DAM REMOVAL

15.	Breach Embankment	1 Lump Sum	$	790,000	$	790,000
	Breaching Operation	$ 100,000				
	Core Wall Demo	$ 60,000				
	ArmorFlex Matting (as needed)	$ 130,000				
	Bypass Pumping	$ 500,000				
16.	Remove Powerhouse and appurtenances	0 Lump Sum	$	680,000	$	-

INCIDENTAL CONSTRUCTION AND REVEGETATION

17.	Construction Office	4	Month	$	750	$ 3,000
18.	Temporary Construction Entrance	1	EA	$	2,000	$ 2,000
19.	Temporary Stream Crossing / Ford	2	EA	$	3,000	$ 6,000
20.	Temporary Haul Road	10000	LF	$	20	$ 200,000
21.	Erosion Control	20000	SY	$	5	$ 100,000
22.	Temporary Seeding	10	AC	$	125	$ 1,250
23.	Permanent Seeding	25	AC	$	1,500	$ 37,500
24.	Live Staking and Plantings	2	AC	$	12,000	$ 24,000
25.	Signage	1	Lump Sum	$	5,500	$ 5,500

Total Construction Cost	**$**	**6,033,400**
Estimated Engineering Costs (20%)	$	1,206,700
Estimated Administration Costs (5%) +$60,000 for sampling and analyses	$	361,700
Subtotal Project Cost	**$**	**7,601,800**
Contingency (20%)	$	1,508,300
Easements and Acquisitions	$	100,000
Total Estimated Project Cost	**$**	**9,210,100**

Conceptual River Restoration Boardman River
Alternative 6: Remove Sabin Dam / No Action at Union St. or Boardman Dams
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
EARTHWORKS AND SITE PREPARATION							
1.	Site Clearing	5	AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	200	CY	$	15	$	3,000
3.	Floodplain and Dry Channel Excavation	26800	CY	$	10	$	268,000
4.	Dam Excavation	20000	CY	$	8	$	160,000
5.	Embankment Earth (Engineered Fill)	0	CY	$	5	$	-
6.	Topsoil (salvaged)	20	AC	$	7,000	$	140,000
7.	Topsoil (furnished)	0	AC	$	14,000	$	-
8.	Sediment Trap Cleaning	47800	CY	$	10	$	478,000
STREAM RESTORATION							
9.	Bank Stabilization (As Needed)	600	LF	$	50	$	30,000
10.	Rock Cross Vanes		CY	$	90	$	-
11.	Rock W Weirs		CY	$	90	$	-
12.	J Hook Vanes		CY	$	90	$	-
13.	Engineered Riffle	1340	SY	$	50	$	67,000
DAM REMOVAL							
13.	Breach Dam	1	Lump Sum	$	100,000	$	100,000
14.	Remove Spillway	1	Lump Sum	$	150,000	$	150,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
15.	Construction Office	4	Month	$	750	$	3,000
16.	Temporary Construction Entrance	1	EA	$	2,000	$	2,000
17.	Temporary Stream Crossing / Ford	2	EA	$	3,000	$	6,000
18.	Temporary Haul Road	8000	LF	$	20	$	160,000
17.	Erosion Control	10000	SY	$	5	$	50,000
18.	Temporary Seeding	5	AC	$	125	$	625
19.	Permanent Seeding	10	AC	$	1,500	$	15,000
20.	Live Staking and Plantings	1	AC	$	12,000	$	12,000
21.	Signage	1	Lump Sum	$	5,500	$	5,500

Total Construction Cost	**$**	**1,687,600**
Estimated Engineering Costs (20%)	$	337,500
Estimated Administration Costs (5%) +$35,000 for sampling and analyses	$	119,400
Subtotal Project Cost	**$**	**2,144,500**
Contingency (20%)	$	421,900
Easements and Acquisitions	$	33,000
Total Estimated Project Cost	**$**	**2,599,400**

Conceptual River Restoration Boardman River
Alternative 7: Remove Boardman Dam / No Action at Union St. or Sabin Dams
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units	Unit Cost	Total Cost
EARTHWORKS AND SITE PREPARATION					
1.	Site Clearing	5	AC	$ 7,500	$ 37,500
2.	Channel Bottom Dredging	1000	CY	$ 15	$ 15,000
3.	Floodplain and Dry Channel Excavation	42400	CY	$ 10	$ 424,000
4.	Road & Dam Excavation	58400	CY	$ 8	$ 467,200
5.	Embankment Earth (Fill for Cass Rd and Bridg	20000	CY	$ 5	$ 100,000
6.	Topsoil (salvaged)	100	AC	$ 7,000	$ 700,000
7.	Topsoil (furnished)	0	AC	$ 14,000	$ -
8.	Sediment Trap Cleaning	85600	CY	$ 10	$ 856,000
STREAM RESTORATION					
9.	Bank Stabilization (As Needed)	1000	LF	$ 50	$ 50,000
10.	Rock Cross Vanes	0	CY	$ 90	$ -
11.	Rock W Weirs	0	CY	$ 90	$ -
12.	Step Pools	0	CY	$ 90	$ -
13.	J Hook Vanes	0	CY	$ 90	$ -
14.	Engineered Riffle	1340	SY	$ 50	$ 67,000
DAM REMOVAL					
15.	Breach Embankment	1	Lump Sum	$ 790,000	$ 790,000
	Breaching Operation	$ 100,000			
	Core Wall Demo	$ 60,000			
	ArmorFlex Matting (as needed)	$ 130,000			
	Bypass Pumping	$ 500,000			
16.	Remove Powerhouse and appurtenances	0	Lump Sum	$ 680,000	$ -
INCIDENTAL CONSTRUCTION AND REVEGETATION					
17.	Construction Office	4	Month	$ 750	$ 3,000
18.	Temporary Construction Entrance	1	EA	$ 2,000	$ 2,000
19.	Temporary Stream Crossing / Ford	2	EA	$ 3,000	$ 6,000
20.	Temporary Haul Road	10000	LF	$ 20	$ 200,000
21.	Erosion Control	20000	SY	$ 5	$ 100,000
22.	Temporary Seeding	10	AC	$ 125	$ 1,250
23.	Permanent Seeding	25	AC	$ 1,500	$ 37,500
24.	Live Staking and Plantings	2	AC	$ 12,000	$ 24,000
25.	Signage	1	Lump Sum	$ 5,500	$ 5,500

Total Construction Cost	**$**	**3,886,000**
Estimated Engineering Costs (20%)	$	777,200
Estimated Administration Costs (5%) +$35,000 for sampling and analyses	$	229,300
Subtotal Project Cost	**$**	**4,892,500**
Contingency (20%)	$	971,500
Easements and Acquisitions	$	61,800.00
Total Estimated Project Cost	**$**	**5,925,800**

Conceptual River Restoration Boardman River
Alternative 8: Remove Sabin and Boardman Dams / No Action at Union St. Dam
Date: 10/9/2012

Item No.	Description	Estimated Quantity	Units		Unit Cost		Total Cost
Sabin Dam							
EARTHWORKS AND SITE PREPARATION							
1.	Site Clearing	5	AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	200	CY	$	15	$	3,000
3.	Floodplain and Dry Channel Excavation	26800	CY	$	10	$	268,000
4.	Dam Excavation	20000	CY	$	8	$	160,000
5.	Embankment Earth (Engineered Fill)	0	CY	$	5	$	-
6.	Topsoil (salvaged)	20	AC	$	7,000	$	140,000
7.	Topsoil (furnished)	0	AC	$	14,000	$	-
8.	Sediment Trap Cleaning	47800	CY	$	10	$	478,000
STREAM RESTORATION							
9.	Bank Stabilization (As Needed)	600	LF	$	50	$	30,000
10.	Rock Cross Vanes		CY	$	90	$	-
11.	Rock W Weirs		CY	$	90	$	-
12.	J Hook Vanes		CY	$	90	$	-
13.	Engineered Riffle	1340	SY	$	50	$	67,000
DAM REMOVAL							
13.	Breach Dam	1	Lump Sum	$	100,000	$	100,000
14.	Remove Spillway	1	Lump Sum	$	150,000	$	150,000
INCIDENTAL CONSTRUCTION AND REVEGETATION							
15.	Construction Office	4	Month	$	750	$	3,000
16.	Temporary Construction Entrance	1	EA	$	2,000	$	2,000
17.	Temporary Stream Crossing / Ford	2	EA	$	3,000	$	6,000
18.	Temporary Haul Road	8000	LF	$	20	$	160,000
17.	Erosion Control	10000	SY	$	5	$	50,000
18.	Temporary Seeding	5	AC	$	125	$	625
19.	Permanent Seeding	10	AC	$	1,500	$	15,000
20.	Live Staking and Plantings	1	AC	$	12,000	$	12,000
21.	Signage	1	Lump Sum	$	5,500	$	5,500

Boardman Dam

EARTHWORKS AND SITE PREPARATION						
1.	Site Clearing	5 AC	$	7,500	$	37,500
2.	Channel Bottom Dredging	1000 CY	$	15	$	15,000
3.	Floodplain and Dry Channel Excavation	42400 CY	$	10	$	424,000
4.	Road & Dam Excavation	58400 CY	$	8	$	467,200
5.	Embankment Earth (Fill for Cass Rd and Bridg	20000 CY	$	5	$	100,000
6.	Topsoil (salvaged)	100 AC	$	7,000	$	700,000
7.	Topsoil (furnished)	0 AC	$	14,000	$	-
8.	Sediment Trap Cleaning	85600 CY	$	10	$	856,000
STREAM RESTORATION						
9.	Bank Stabilization (As Needed)	1000 LF	$	50	$	50,000
10.	Rock Cross Vanes	0 CY	$	90	$	-
11.	Rock W Weirs	0 CY	$	90	$	-
12.	Step Pools	0 CY	$	90	$	-
13.	J Hook Vanes	0 CY	$	90	$	-
14.	Engineered Riffle	1340 SY	$	50	$	67,000
DAM REMOVAL						
15.	Breach Embankment	1 Lump Sum	$	790,000	$	790,000
	Breaching Operation	$ 100,000				
	Core Wall Demo	$ 60,000				
	ArmorFlex Matting (as needed)	$ 130,000				
	Bypass Pumping	$ 500,000				
16.	Remove Powerhouse and appurtenances	0 Lump Sum	$	680,000	$	-
INCIDENTAL CONSTRUCTION AND REVEGETATION						
17.	Construction Office	4 Month	$	750	$	3,000
18.	Temporary Construction Entrance	1 EA	$	2,000	$	2,000
19.	Temporary Stream Crossing / Ford	2 EA	$	3,000	$	6,000
20.	Temporary Haul Road	10000 LF	$	20	$	200,000
21.	Erosion Control	20000 SY	$	5	$	100,000
22.	Temporary Seeding	10 AC	$	125	$	1,250
23.	Permanent Seeding	25 AC	$	1,500	$	37,500
24.	Live Staking and Plantings	2 AC	$	12,000	$	24,000
25.	Signage	1 Lump Sum	$	5,500	$	5,500

Total Construction Cost	**$**	**5,573,600**
Estimated Engineering Costs (20%)	$	1,114,700
Estimated Administration Costs (5%) +$60,000 for sampling and analyses	$	338,700
Subtotal Project Cost	**$**	**7,027,000**
Contingency (20%)	$	1,393,400
Easements and Acquisitions	$	94,800
Total Estimated Project Cost	**$**	**8,515,200**

Conceptual River Restoration Boardman River
Alternative Summary
Date: 10/9/2012

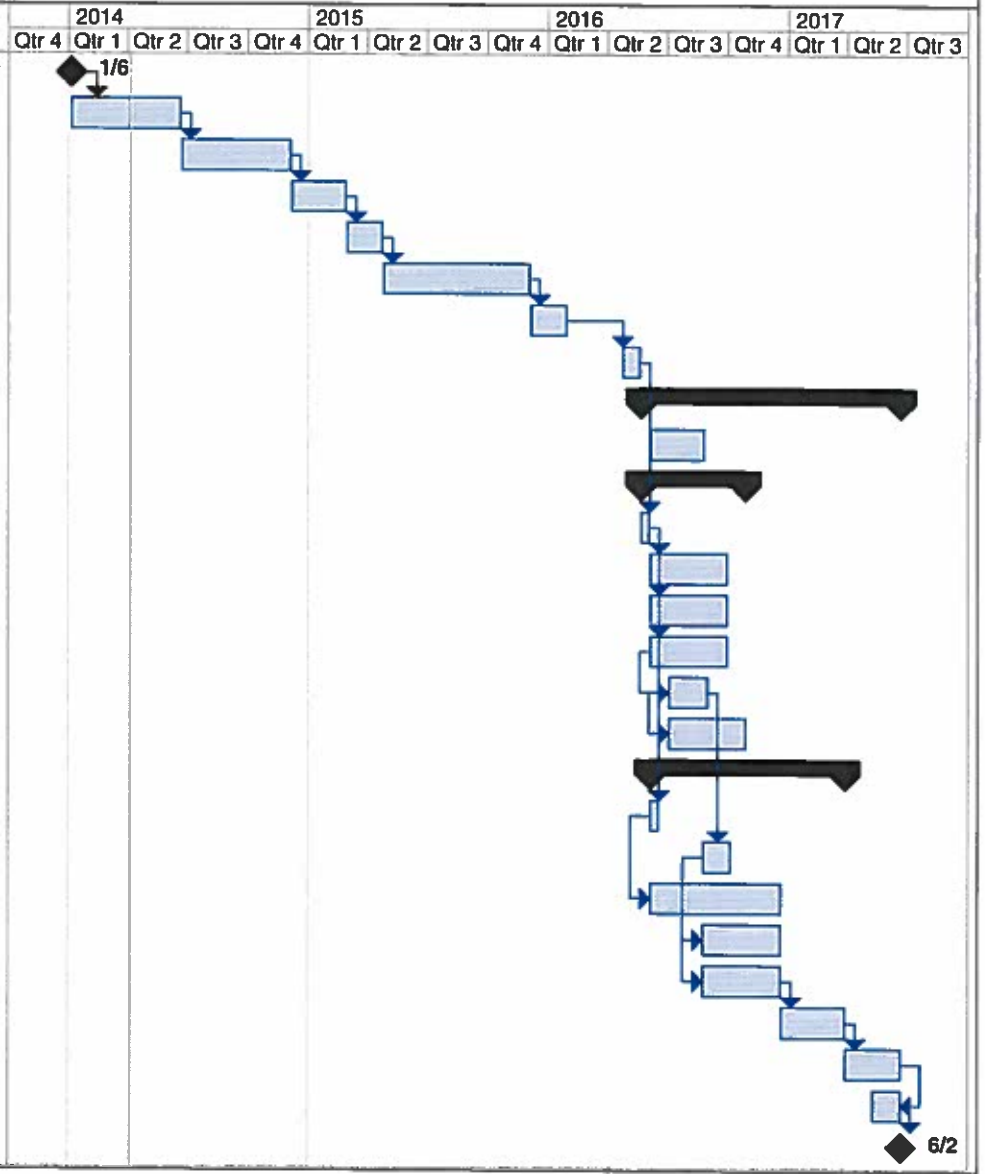
Alternative	Description	Total Est.Construction Cost	Total Est. Project Cost
1	No Action	$ -	$ -
2	Modify Union St. Dam	$ 459,800	$ 695,000
3	Modify Union St. Dam, Remove Sabin Dam	$ 2,147,400	$ 3,294,400
4	Modify Union St. Dam, Remove Boardman Dam	$ 4,345,800	$ 6,620,700
5	Modify Union St. Dam, Remove Sabin and Boardman Dams	$ 6,033,400	$ 9,210,100
6	Remove Sabin Dam	$ 1,687,600	$ 2,599,400
7	Remove Boardman Dam	$ 3,886,000	$ 5,925,800
8	Remove Sabin and Boardman Dams	$ 5,573,600	$ 8,515,200

ATTACHMENT 4

DESIGN AND CONSTRUCTION SCHEDULE

BOARDMAN RIVER FEASIBILITY STUDY
DESIGN/CONSTRUCTION SCHEDULE

ID	Task Name	Duration	Start	Finish
1	Final LDR Approval	0 days	Mon 1/6/14	Mon 1/6/14
2	Preliminary Engineering Design	6 mons	Mon 1/6/14	Fri 6/20/14
3	Development of Plans and Specs	6 mons	Mon 6/23/14	Fri 12/5/14
4	Design Documentation Report (DDR)	3 mons	Mon 12/8/14	Fri 2/27/15
5	ITR Review of DDR	2 mons	Mon 3/2/15	Fri 4/24/15
6	Easement Acquisition	8 mons	Mon 4/27/15	Fri 12/4/15
7	Bidding / Award	2 mons	Mon 12/7/15	Fri 1/29/16
8	Mobilization	20 days	Mon 4/25/16	Fri 5/20/16
9	**Construction**	**283 days**	**Mon 5/23/16**	**Wed 6/21/17**
10	**Union Street Dam Modifications**	60 days	Mon 6/6/16	Fri 8/26/16
11	**Boardman Dam**	**115 days**	**Mon 5/23/16**	**Fri 10/28/16**
12	Clearing and Erosion Control	10 days	Mon 5/23/16	Fri 6/3/16
13	Cass Road Bridge Construction	85 days	Mon 6/6/16	Fri 9/30/16
14	Sediment Trap/Sediment Mgmt.	85 days	Mon 6/6/16	Fri 9/30/16
15	Earthwork	85 days	Mon 6/6/16	Fri 9/30/16
16	Dam Breaching	43 days	Mon 7/4/16	Wed 8/31/16
17	Stream Restoration	85 days	Mon 7/4/16	Fri 10/28/16
18	**Sabin Dam**	**213 days**	**Mon 6/6/16**	**Wed 3/29/17**
19	Clearing and Erosion Control	10 days	Mon 6/6/16	Fri 6/17/16
20	Dam Removal	30 days	Thu 8/25/16	Wed 10/5/16
21	Sediment Trap/Sediment Mgmt.	143 days	Mon 6/6/16	Wed 12/21/16
22	Earthwork	85 days	Thu 8/25/16	Wed 12/21/16
23	Stream Restoration	85 days	Thu 8/25/16	Wed 12/21/16
24	Winter Shutdown	70 days	Thu 12/22/16	Wed 3/29/17
25	Final Site Restoration	60 days	Thu 3/30/17	Wed 6/21/17
26	Closeout and Demobilization	30 days	Thu 5/11/17	Wed 6/21/17
27	Project Completion	0 mons	Wed 6/21/17	Wed 6/21/17



Project: Design and Construction Sch
Date: Fri 4/4/14

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

ATTACHMENT 5

ABBREVIATED RISK ANALYSIS

Abbreviated Risk Analysis

Boardman River Feasibility Study
Feasibility (Recommended Plan)

Meeting Date: 19-Jul-12

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

Project Management:	Carl Platz
Planner:	John Love
Study Manager:	
Contracting:	Nancy Salisbury
Real Estate:	Glenn Spence
Relocations:	
OTHER:	Hal Harrington, Paul Allerding
Engineering & Design:	Tim Smith, Pam Horner
Technical Lead:	Jihad Safa
Geotech:	NAME
Hydrology:	Shelley Tule
Civil:	NAME
Structural:	NAME
Mechanical:	NAME
Electrical:	NAME
Cost Engineering:	Julie Udell
Construction:	NAME
Operations:	NAME
Economics	Ashley Binion
OTHER:	NAME
OTHER:	NAME
OTHER:	NAME
OTHER:	NAME
OTHER:	NAME
OTHER:	NAME
OTHER:	NAME

Abbreviated Risk Analysis

Project (less than $40M): **Boardman River Feasibility Study**
Project Development Stage: **Feasibility (Recommended Plan)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = $ 7,301,400

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 116,000		4.00%	$ 4,640	$ 120,640.00
1	02 RELOCATIONS	None	$ -		0.00%	$ -	$ -
2	06 FISH AND WILDLIFE FACILITIES	Mobil./Demob/Prep Work	$ 273,472		11.10%	$ 30,360	$ 303,832.31
3	06 FISH AND WILDLIFE FACILITIES	Earthwork and Site Prep (Sabin)	$ 1,087,203		19.48%	$ 211,783	$ 1,298,986.07
4	06 FISH AND WILDLIFE FACILITIES	Dam Removal and Stream Restor. (Sabin)	$ 444,480		37.55%	$ 166,899	$ 611,379.28
5	06 FISH AND WILDLIFE FACILITIES	Incidental Const. & Reveg. (Sabin)	$ 524,295		15.38%	$ 80,620	$ 604,915.28
6	06 FISH AND WILDLIFE FACILITIES	Earthwork and Site Prep (Boardman)	$ 2,261,455		37.37%	$ 845,128	$ 3,106,582.56
7	06 FISH AND WILDLIFE FACILITIES	Dam Remov. and Stream Restor. (Bdman)	$ 1,363,017		38.57%	$ 525,723	$ 1,888,739.70
8	06 FISH AND WILDLIFE FACILITIES	Incidental Const. & Reveg. (Boardman)	$ 705,176		18.63%	$ 131,369	$ 836,544.52
9	06 FISH AND WILDLIFE FACILITIES	Fish Lift (Union)	$ 259,746		21.78%	$ 56,580	$ 316,325.53
10	06 FISH AND WILDLIFE FACILITIES	Site Work (Union)	$ 331,139		49.71%	$ 164,625	$ 495,763.85
11	06 FISH AND WILDLIFE FACILITIES	Incidental Const. & Reveg. (Union)	$ 51,426		15.38%	$ 7,908	$ 59,333.72
12		Remaining Construction Items	$ (9)	*0.0%*	0.00%	$ (0)	$ (9.45)
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 1,250,000		35.77%	$ 447,101	$ 1,697,100.71
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 650,000		36.42%	$ 236,712	$ 886,712.19

Totals					
Real Estate	$ 116,000	4.00%	$ 4,640	$ 120,640.00
Total Construction Estimate	$ 7,301,400	30.42%	$ 2,220,993	$ 9,522,393
Total Planning, Engineering & Design	$ 1,250,000	35.77%	$ 447,101	$ 1,697,101
Total Construction Management	$ 650,000	36.42%	$ 236,712	$ 886,712
Total	$ 9,317,400		$ 2,909,446	$ 12,226,846

Boardman River Feasibility Study
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Meeting Date: 19-Jul-12

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	3	3	3
Likely	1	2	3	4	4
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	75%
PS-1	None	• Potential for scope growth, added features and quantities?	None	Limits of bridge replacement well defined	Unlikely	Negligible	0
PS-2	Mobil./Demob/Prep Work	• Potential for scope growth, added features and quantities?	None	Project-wide mobilization.Easy access to all sites	Unlikely	Marginal	0
PS-3	Earthwork and Site Prep (Sabin)	• Potential for scope growth, added features and quantities?	None	Well developed with good data.	Possible	Marginal	1
PS-4	Dam Removal and Stream Restor. (Sabin)	• Investigations sufficient to support design assumptions?	• Investigations sufficient to support design assumptions?	Additional geotechnical testing needs to be performed in PED, along with discussions with contractor to determine type of equipment required. Density of concrete and dam conditions to be determined.	Likely	Significant	3
PS-5	Incidental Const. & Reveg. (Sabin)	• Potential for scope growth, added features and quantities?	None	Low risk. Related to items where there is a good understanding of areas where this is needed. Easily identified.	Possible	Marginal	1
PS-6	Earthwork and Site Prep (Boardman)	• Investigations sufficient to support design assumptions?	• Investigations sufficient to support design assumptions?	Volume of sediment uncertain, will impact sediment trap cleaning, as well as channel bottom dredging and floodplain excavation. Additional short term depth of refusal analysis needed. Ability to drive equipment on dewatered sediment unknown.	Likely	Significant	3
PS-7	Dam Remov. and Stream Restor. (Bdman)	• Investigations sufficient to support design assumptions?	• Water care and diversion fully understood, planned? • Investigations sufficient to support design assumptions?	Concern with geotechnical and sequencing. Will be excavating one channel while water flows through the other and there is a large vertical drop to deal with. Density of concrete and dam conditions to be determined.	Likely	Significant	3
PS-8	Incidental Const. & Reveg. (Boardman)	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities?	Arsenic levels are a concern. Additional sampling has been done and has shown that this soil can be placed at the site but may need thicker cover of topsoil than originally anticipated.	Possible	Significant	2
PS-9	Fish Lift (Union)	• Potential for scope growth, added features and quantities?	None	Manufacturer's quote, manufacturer's design	Unlikely	Negligible	0
PS-10	Site Work (Union)	• Design confidence?	• Design confidence?	Access could be an issue. Unknown how fish lift will act with existing trap and transfer facility.	Likely	Significant	3
PS-11	Incidental Const. & Reveg. (Union)	• Potential for scope growth, added features and quantities?	None	Low risk. Related to items where there is a good understanding of areas where this is needed. Easily identified.	Possible	Marginal	1
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	N/A		Unlikely	Negligible	0
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?	Scheduling and sequencing of bridge/road removal	Scheduling and sequencing are a concern. Work at Boardman dam must be completed during summer months and not school year. If the school district is unable to use this bridge they will incur large cost for rerouting buses. Since bridge work is involved, must also coordinate w/ local road comission. Since these activities can still be planned in this phase, this is considered a lower risk level.	Possible	Marginal	1
PS-14	Construction Management	• Potential for scope growth, added features and quantities?	Scheduling and sequencing of bridge/road removal	Scheduling and sequencing are a concern. Work at Boardman dam must be completed during summer months and not school year. If the school district is unable to use this bridge they will incur large cost for rerouting buses. Since bridge work is involved, must also coordinate w/ local road comission.	Likely	Significant	3

Acquisition Strategy

							Max Potential Cost Growth	30%
AS-1	None	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Negligible		0
AS-2	Mobil./Demob/Prep Work	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-3	Earthwork and Site Prep (Sabin)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-4	Dam Removal and Stream Restor. (Sabin)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-5	Incidental Const. & Reveg. (Sabin)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-6	Earthwork and Site Prep (Boardman)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-7	Dam Remov. and Stream Restor. (Bdman)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-8	Incidental Const. & Reveg. (Boardman)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-9	Fish Lift (Union)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-10	Site Work (Union)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-11	Incidental Const. & Reveg. (Union)	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-12	Remaining Construction Items	• Contracting plan firmly established?	N/A		Unlikely	Negligible		0
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?	Acquisition strategy not well defined.	This project is a likely candidate a source selection process as some of the construction features are somewhat complex. This statement applies to all potential risk areas.	Possible	Marginal		1
AS-14	Construction Management	• Contracting plan firmly established?	None.	Acquisition strategy shouldn't affect this stage of the project.	Unlikely	Negligible		0

Construction Elements

							Max Potential Cost Growth	25%
CE-1	None	• Accelerated schedule or harsh weather schedule?	• Accelerated schedule or harsh weather schedule?	Bridge demo/reconstruction must be accomplished during the school summer shutdown to avoid significant detour.	Possible	Negligible	0
CE-2	Mobil./Demob/Prep Work	• Accelerated schedule or harsh weather schedule?	None	Good access, typical land equipment.	Unlikely	Marginal	0
CE-3	Earthwork and Site Prep (Sabin)	• Accelerated schedule or harsh weather schedule?	None	Not complex, just moving earth.	Possible	Marginal	1
CE-4	Dam Removal and Stream Restor. (Sabin)	• Potential for construction modification and claims?	• Potential for construction modification and claims?	Work partially done in wet with flowing water; errors and mistakes could cause erosion or loss of dam. More controls needed for operation. Unpredicatable nature of dam breach.	Likely	Significant	3
CE-5	Incidental Const. & Reveg. (Sabin)	• Accelerated schedule or harsh weather schedule?	None	Traditional work	Possible	Marginal	1
CE-6	Earthwork and Site Prep (Boardman)	• Accelerated schedule or harsh weather schedule?	• Accelerated schedule or harsh weather schedule?	Scheduling and sequencing is needed.	Likely	Significant	3
CE-7	Dam Remov. and Stream Restor. (Bdman)	• High risk or complex construction elements, site access, in-water?	• High risk or complex construction elements, site access, in-water?	Working in the wet, it's an involved process to breach dam and lower water; takes time; construction is complex. Contractors were consulted and they assisted in crafting the activity sequence. Private, individual wells provide drinking water to the parcels along the Boardman River above Boardman Dam. Well records from Grand Traverse Health Department indicate that all wells along this segment of the Boardman River are screened at a depth below the expected groundwater after dam removal. Thus, the change in groundwater is not expected to impact drinking water supply. However, since not all parcels along the river had well records on file it is possible that some of them have shallow wells that will be impacted. For this to occur the well would have to be screened less than 30 ft from the ground surface. This depth does not comply with the health code. In addition, the number of wells potentially affected is low. Therefore, the risk and potential cost implications of a change in groundwater level is low.	Possible	Significant	2
CE-8	Incidental Const. &	• Accelerated schedule or harsh weather schedule?	None	Traditional work	Possible	Marginal	1
CE-9	Fish Lift (Union)	• Accelerated schedule or harsh weather schedule?	None	Manufacturer's design	Possible	Marginal	1
CE-10	Site Work (Union)	• Unique construction methods?	• Unique construction methods?	Placement only, concern that this does't negatively impact existing trap and sort facilities.	Likely	Marginal	2
CE-11	Incidental Const. &	• Accelerated schedule or harsh weather schedule?	None	Traditional work	Possible	Marginal	1
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	N/A		Unlikely	Negligible	0
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?	Scheduling and sequencing of bridge/road removal	Scheduling and sequencing are a concern. Work at Boardman dam must be completed during summer months and not school year. If the school district is unable to use this bridge they will incur large cost for rerouting buses. Since bridge work is involved, must also coordinate w/ local road commission. Since these activities can still be planned in this phase, this is considered a lower risk level.	Possible	Marginal	1
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?	Scheduling and sequencing of bridge/road removal	Scheduling and sequencing are a concern. Work at Boardman dam must be completed during summer months and not school year. If the school district is unable to use this bridge they will incur large cost for rerouting buses. Since bridge work is involved, must also coordinate w/ local road commission.	Likely	Significant	3

Quantities for Current Scope

							Max Potential Cost Growth	20%
Q-1	None	• Level of confidence based on design and assumptions?	None	Limits of bridge replacement well defined	Possible	Negligible	0
Q-2	Mobil./Demob/Prep Work	• Level of confidence based on design and assumptions?	None	Typical land based construction equipment.	Possible	Negligible	0
Q-3	Earthwork and Site Prep (Sabin)	• Level of confidence based on design and assumptions?	None	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Marginal	1
Q-4	Dam Removal and Stream Restor. (Sabin)	• Level of confidence based on design and assumptions?	None	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Marginal	1
Q-5	Incidental Const. & Reveg. (Sabin)	• Level of confidence based on design and assumptions?	None	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Negligible	0
Q-6	Earthwork and Site Prep (Boardman)	• Sufficient investigations to develop quantities?	• Sufficient investigations to develop quantities?	Additional sediment depth analysis needed	Likely	Significant	3
Q-7	Dam Remov. and Stream Restor.	• Level of confidence based on design and assumptions?	No.	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Marginal	1
Q-8	Incidental Const. & Reveg. (Boardman)	• Level of confidence based on design and assumptions?	None	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Negligible	0
Q-9	Fish Lift (Union)	• Level of confidence based on design and assumptions?	None	Manufacturer provided.	Possible	Negligible	0
Q-10	Site Work (Union)	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	Field work has been conducted to see how to accommodate fish lift; expect quantities to change as design is refined.	Likely	Significant	3
Q-11	Incidental Const. & Reveg. (Union)	• Level of confidence based on design and assumptions?	None	Lots of field work and analysis has been conducted to characterize sediments.	Possible	Negligible	0
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	N/A		Unlikely	Negligible	0
Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?	None		Unlikely	Negligible	0
Q-14	Construction Management	• Level of confidence based on design and assumptions?	None		Unlikely	Negligible	0

Specialty Fabrication or Equipment

							Max Potential Cost Growth	75%
FE-1	None	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-2	Mobil./Demob/Prep Work	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-3	Earthwork and Site Prep (Sabin)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-4	Dam Removal and Stream Restor. (Sabin)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-5	Incidental Const. & Reveg. (Sabin)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-6	Earthwork and Site Prep (Boardman)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-7	Dam Remov. and Stream Restor.	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-8	Incidental Const. & Reveg. (Boardman)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-9	Fish Lift (Union)	• Unusual parts, material or equipment manufactured or installed?	None	Manufacturer provided	Possible	Marginal	1
FE-10	Site Work (Union)	• Unusual parts, material or equipment manufactured or installed?	• Unusual parts, material or equipment manufactured or installed?	Adapting to existing facility could potentially be cause for concern. May have to fabricate to make things work; this would be site specific to allow manufacturer's fishlift to function w/ in existing trap and transfer facility.	Likely	Significant	3
FE-11	Incidental Const. & Reveg. (Union)	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	N/A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?	• Unusual parts, material or equipment manufactured or installed?	Refine design to adapt to existing facility	Likely	Significant	3
FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?	None		Unlikely	Negligible	0

Cost Estimate Assumptions

						Max Potential Cost Growth	35%
CT-1	None	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Negligible	0
CT-2	Mobil./Demob/Prep Work	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-3	Earthwork and Site Prep (Sabin)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-4	Dam Removal and Stream Restor. (Sabin)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Significant	2
CT-5	Incidental Const. & Reveg. (Sabin)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-6	Earthwork and Site Prep (Boardman)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-7	Dam Remov. and Stream Restor. (Bdman)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Large lump sum cost for bypass pumping based on only one contractor quotation (impact could be significant).	Likely	Significant	3
CT-8	Incidental Const. & Reveg. (Boardman)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-9	Fish Lift (Union)	• Reliability and number of key quotes?	None	Based on quotes. Large lump sum cost for fish lift based on only one contractor quotation (impact could be significant).	Likely	Significant	3
CT-10	Site Work (Union)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks and recent similar projects. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-11	Incidental Const. & Reveg. (Union)	• Reliability and number of key quotes?	None	Cost derived from RSmeans costbooks, recent similar projects and contractor quotes. Likelyhood of change possible as design develops.	Possible	Marginal	1
CT-12	Remaining Construction Items	• Reliability and number of key quotes?	N/A		Unlikely	Negligible	0
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?	None	Expect the cost estimate to continue to refine through this period.	Possible	Marginal	1
CT-14	Construction Management	• Reliability and number of key quotes?	None	Additional cost estimate preparation could occur if modification is necessary.	Possible	Marginal	1

External Project Risks

							Max Potential Cost Growth	40%
EX-1	None	• Political influences, lack of support, obstacles?	• Political influences, lack of support, obstacles?	Work needs to be completed during the school shutdown and coordinated with other dam removal efforts	Possible	Negligible	0
EX-2	Mobil./Demob/Prep Work	• Potential for severe adverse weather?	No	Good access under all conditions	Possible	Marginal	1
EX-3	Earthwork and Site Prep (Sabin)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Significant	2
EX-4	Dam Removal and Stream Restor. (Sabin)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Significant	2
EX-5	Incidental Const. & Reveg. (Sabin)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Marginal	1
EX-6	Earthwork and Site Prep (Boardman)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Marginal	1
EX-7	Dam Remov. and Stream Restor. (Bdman)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Significant	2
EX-8	Incidental Const. & Reveg. (Boardman)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Marginal	1
EX-9	Fish Lift (Union)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Marginal	1
EX-10	Site Work (Union)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Significant	2
EX-11	Incidental Const. & Reveg. (Union)	• Potential for severe adverse weather?	Volume of runoff/stream flow	Heavily dependent on receiving typical or average water flows. It's desirable to construct during low flow periods such as summer or fall but if higher than expected flows occur, the schedule will lengthen.	Possible	Marginal	1
EX-12	Remaining Construction Items	• Potential for severe adverse weather?	N/A		Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?	Volume of runoff/stream flow	Contingency will be needed in design if flow is not typical; if low flow doesn't occur by dry weather season the schedule will be affected and may have to revisit revised work plan that pushes work into less desirable season.	Likely	Significant	3
EX-14	Construction Management	• Potential for severe adverse weather?	Volume of runoff/stream flow	Contingency will be needed in design if flow is not typical; if low flow doesn't occur by dry weather season the schedule will be affected and may have to revisit revised work plan that pushes work into less desirable season.	Likely	Significant	3

Boardman River Feasibility Study
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Typical Risk Elements	Potential Risk Areas													
	None	Mobil./Demob/Prep Work	Earthwork and Site Prep (Sabin)	Dam Removal and Stream Restor. (Sabin)	Incidental Const. & Reveg. (Sabin)	Earthwork and Site Prep (Boardman)	Dam Remov. and Stream Restor. (Bdman)	Incidental Const. & Reveg. (Boardm	Fish Lift (Union)	Site Work (Union)	Incidental Const. & Reveg. (Union)	Remaining Construction Ite	Planning, Engineering, & Design	Construction Management
Project Scope Growth	-	-	1	3	1	3	3	2	-	3	1	-	1	3
Acquisition Strategy	-	1	1	1	1	1	1	1	1	1	1	-	1	-
Construction Elements	-	-	1	3	1	3	2	1	1	2	1	-	1	3
Quantities for Current Scope	-	-	1	1	-	3	1	-	-	3	-	-	-	-
Specialty Fabrication or Equipment	-	-	-	-	-	-	-	-	1	3	-	-	3	-
Cost Estimate Assumptions	-	1	1	2	1	1	3	1	3	1	1	-	1	1
External Project Risks	-	1	2	2	1	1	2	1	1	2	1	-	3	3

ATTACHMENT 6

TOTAL PROJECT COST SUMMARY

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

LRE - PN 127507
Boardman River
Section 5011 Great Lakes Fishery & Ecosystem Restoration Program

The Boardman River – Section 5011 Great Lakes Fishery & Ecosystem Restoration Project, as presented by the Detroit District, has undergone a successful Cost Agency Technical Review (Cost ATR) of remaining costs, performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the cost products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of April 30, 2014, the Cost MCX certifies the estimated total project cost:

FY2014 First Costs:	$12,769,000
Total Project Costs:	$ 13,233,000
Estimated Federal Costs:	$ 9,930,000

Note: Cost ATR was devoted to remaining work. It did not review spent costs, which requires an audit process. It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management throughout the life of the project.

Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Boardman River Feasibility Study**
LOCATION: Boardman River, Kalkaska and Grand Traverse Counties, MI

DISTRICT: Detroit
POC: CHIEF, COST ENGINEERING, xxx

PREPARED: 2/8/2014

This Estimate reflects the scope and schedule in report; BOARDMAN RIVER FEASIBILITY STUDY DETAILED PROJECT REPORT

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-13 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$7,301	$2,220	30%	$9,521	3.8%	$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
	CONSTRUCTION ESTIMATE TOTALS:	$7,301	$2,220		$9,521	3.8%	$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
01	LANDS AND DAMAGES	$116	$5	4%	$121	3.8%	$120	$4.82	$125.20			$122	$5	$127
30	PLANNING, ENGINEERING & DESIGN	$1,299	$465	36%	$1,764	4.5%	$1,357	$485	$1,843			$1,386	$496	$1,882
31	CONSTRUCTION MANAGEMENT	$646	$235	36%	$881	4.5%	$675	$246	$921			$737	$268	$1,005
	PROJECT COST TOTALS:	$9,362	$2,924	31%	$12,286		$9,729	$3,039	**$12,769**			$10,074	$3,149	$13,223

Mandatory by Regulation	CHIEF, COST ENGINEERING, xxx	**ESTIMATED TOTAL PROJECT COST:**		**$13,223**
		ESTIMATED FEDERAL COST:	65%	$8,595
Mandatory by Regulation	PROJECT MANAGER, xxx	ESTIMATED NON-FEDERAL COST:	35%	$4,628
Mandatory by Regulation	CHIEF, REAL ESTATE, xxx	**22 - FEASABILITY STUDY (GLFER studies):**		**$2,000**
		ESTIMATED FEDERAL COST:		$1,335
	CHIEF, PLANNING,xxx	ESTIMATED NON-FEDERAL COST:		$665
	CHIEF, ENGINEERING, xxx	**ESTIMATED FEDERAL COST OF PROJECT**		**$9,930**
	CHIEF, OPERATIONS, xxx			
	CHIEF, CONSTRUCTION, xxx			
	CHIEF, CONTRACTING,xxx			
	CHIEF, PM-PB, xxxx			
	CHIEF, DPM, xxx			

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Boardman River Feasibility Study
LOCATION: Boardman River, Kalkaska and Grand Traverse Counties, MI
This Estimate reflects the scope and schedule in report; BOARDMAN RIVER FEASIBILITY STUDY DETAILED PROJECT REPORT

DISTRICT: Detroit
POC: CHIEF, COST ENGINEERING, xxx
PREPARED: 2/8/2014

Estimate Prepared: 15-Feb-13
Effective Price Level: 1-Oct-13

Program Year (Budget EC): 2015
Effective Price Level Date: 1 OCT 14

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$7,301	$2,220	30%	$9,521	3.8%	$7,577	$2,303	$9,880	2016Q4	3.3%	$7,829	$2,380	$10,209
	CONSTRUCTION ESTIMATE TOTALS:	$7,301	$2,220	30%	**$9,521**		$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
01	LANDS AND DAMAGES	$116	$5	4%	$121	3.8%	$120	$5	$125	2015Q4	1.3%	$122	$5	$127
30	PLANNING, ENGINEERING & DESIGN													
2.0%	Project Management	$146	$52	36%	$198	4.5%	$153	$55	$207	2015Q1		$153	$55	$207
3.0%	Planning & Environmental Compliance	$219	$78	36%	$297	4.5%	$229	$82	$311	2015Q1		$229	$82	$311
5.0%	Engineering & Design	$365	$131	36%	$496	4.5%	$381	$136	$518	2015Q1		$381	$136	$518
1.0%	Engineering Tech Review ITR & VE	$73	$26	36%	$99	4.5%	$76	$27	$104	2015Q1		$76	$27	$104
1.0%	Contracting & Reprographics	$73	$26	36%	$99	4.5%	$76	$27	$104	2015Q1		$76	$27	$104
3.0%	Engineering During Construction	$219	$78	36%	$297	4.5%	$229	$82	$311	2017Q1	7.5%	$246	$88	$334
2.0%	Planning During Construction	$146	$52	36%	$198	4.5%	$153	$55	$207	2017Q1	7.5%	$164	$59	$223
0.8%	Sampling/Analysis and Phase I	$58	$21	36%	$79	4.5%	$61	$22	$82	2015Q1		$61	$22	$82
	Project Operations			36%										
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$365	$133	36%	$498	4.5%	$381	$139	$520	2017Q1	7.5%	$410	$149	$559
1.0%	Project Operation:	$73	$27	36%	$100	4.5%	$76	$28	$104	2017Q1	7.5%	$82	$30	$112
0.9%	Effectiveness Monitoring	$62	$23	36%	$85	4.5%	$65	$24	$88	2021Q1	25.4%	$81	$30	**$111**
2.0%	Project Management	$146	$53	36%	$199	4.5%	$153	$56	$208	2017Q1	7.5%	$164	$60	$224
	CONTRACT COST TOTALS:	$9,362	$2,924		**$12,286**		$9,729	$3,039	$12,769			$10,074	$3,149	**$13,223**

ATTACHMENT 7

MII COST ESTIMATE

The Feasibility Study for the Boardman River explores the potential to restore tributary habitat for fish by restoring the connectivity and coldwater characteristics of the Boardman River and potentially increasing the diversity of species moving between the Great Lakes and the river. This is accomplished by evaluating the potential modification or removal of three existing dams, including the Union Street, Sabin and Boardman dams. Restoration of habitat has been identified as a high priority for the entire Great Lakes Basin and the support plan for the Great Lakes Fishery and Ecosystem Restoration program.

The project objectives include reconnecting and restoring tributary habitat, allowing unimpeded movement of woody debris and sediment materials through the river system, negating thermal disruption, and restoring the natural balance between coldwater and coolwater species. These objectives are to be accomplished without transporting pollutants into Grand Traverse Bay of Lake Michigan or allowing upstream migration of aquatic invasive species.

A series of upstream and downstream fish passage measures were screened and evaluated, then developed into several alternatives for detailed analysis, as presented in the Detailed Project Report. The selected alternative (Alternative No. 5) consists of modifications to the Union Street dam (for downstream fish passage) and removal of the Sabin and Boardman dams. This MII cost estimate presents the cost to implement the selected alternative.

Revisions to the previous estimate (revised 95%) include:

- Addition of land and damages costs from the Real Estate Plan (WBS 01)
- Moved Cass Street Bridge to Relocation (WBS 02)
- Updated Davis-Bacon wage rates
- Updated fuel costs
- Updated cost of money
- Addition of notes for user-defined cost sources
- Revisions to JOOH per the anticipated construction schedule
- Revised bond rates
- Revised mobilization/demobilization
- Addition of estimated construction duration
- Addition of overtime during dam breaching and bridge construction
- Misc. revisions

Estimated by	Terry Woodward, URS Corporation
Designed by	URS Corporation
Prepared by	Terry Woodward
Preparation Date	2/15/2013
Effective Date of Pricing	10/1/2012
Estimated Construction Time	365 Days

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Designed by
URS Corporation

Estimated by
Terry Woodward, URS Corporation

Prepared by
Terry Woodward

Design Document Detailed Project Report - 100%
Document Date 3/7/2013
District Detroit
Contact Terry Woodward
Budget Year 2013
UOM System Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost

Timeline/Currency
Preparation Date 2/15/2013
Escalation Date 10/1/2012
Eff. Pricing Date 10/1/2012
Estimated Duration 365 Day(s)

Currency US dollars
Exchange Rate 1.000000

Costbook CB10EB: MII English Cost Book 2010

Labor MI130037: Michigan MI130037 dated 01/04/2013
Note: Updated with rates from General Decision Number MI130037, dated 01/04/2013

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP11R02: MII Equipment 2011 Region 02
Note: Fuel prices updated to Midwest pricing as of 2/4/13 Electical cost updated to Midwest pricing as of 11/30/12

02 MIDEAST

Sales Tax	6.00
Working Hours per Year	1,450
Labor Adjustment Factor	1.01
Cost of Money	1.75
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.154
Gas	3.513
Diesel Off-Road	3.430
Diesel On-Road	3.980

Shipping Rates

Over 0 CWT	9.67
Over 240 CWT	8.90
Over 300 CWT	8.01
Over 400 CWT	7.19
Over 500 CWT	4.67
Over 700 CWT	4.67
Over 800 CWT	7.09

Date	Author	Note

Direct Cost Markups

Productivity	Category	Method
Overtime	Productivity	Productivity
	Overtime	Overtime

	Days/Week	Hours/Shift	Shifts/Day	1st Shift	2nd Shift	3rd Shift
Standard	5.00	8.00	1.00	8.00	0.00	0.00
Actual	6.00	8.00	1.00	10.00	0.00	0.00

Day	OT Factor	Working
Monday	1.50	Yes
Tuesday	1.50	Yes
Wednesday	1.50	Yes
Thursday	1.50	Yes
Friday	1.50	Yes
Saturday	2.00	Yes
Sunday	2.00	No

OT Percent	FCCM Percent
25.00	(33.33)

Sales Tax — TaxAdj — Running % on Selected Costs

MatlCost

OT Bridge — Overtime — Overtime

	Days/Week	Hours/Shift	Shifts/Day	1st Shift	2nd Shift	3rd Shift
Standard	5.00	8.00	1.00	8.00	0.00	0.00
Actual	7.00	8.00	1.00	12.00	0.00	0.00

Day	OT Factor	Working
Monday	1.50	Yes
Tuesday	1.50	Yes
Wednesday	1.50	Yes
Thursday	1.50	Yes
Friday	1.50	Yes
Saturday	2.00	Yes
Sunday	2.00	Yes

OT Percent	FCCM Percent
40.48	(52.38)

Contractor Markups

JOOH (Small Tools)	Category	Method
JOOH	Allowance	% of Labor
HOOH	JOOH	JOOH (Calculated)
Profit	HOOH	Running %
	Profit	Profit Weighted Guidelines

Guideline	*Value*	*Weight*	*Percentage*
Risk	0.100	20	2.00
Difficulty	0.100	15	1.50
Size	0.040	15	0.60
Period	0.120	15	1.80
Invest (Contractor's)	0.070	5	0.35
Assist (Assistance by)	0.120	5	0.60
SubContracting	0.118	25	2.95
Total		100	9.80

Bond — Bond — Bond Table

Class B, Tiered, 24 months, 1.00% Surcharge

Contract Price	*Bond Rate*
500,000	*15.84*
2,000,000	*9.57*
2,500,000	*7.59*
2,500,000	*6.93*
7,500,000	*6.34*

Excise Tax	Excise	Running %
JOOH 1 (Small Tools)	JOOH	% of Labor
JOOH 1	JOOH	JOOH (Calculated)
Profit 1	Profit	Profit Weighted Guidelines

	Value	*Weight*	*Percentage*
Guideline	*0.080*	*20*	*1.60*
Risk	*0.090*	*15*	*1.35*
Difficulty	*0.110*	*15*	*1.65*
Size	*0.120*	*15*	*1.80*
Period	*0.040*	*5*	*0.20*
Invest (Contractor's)	*0.120*	*5*	*0.60*
Assist (Assistance by)	*0.120*	*25*	*3.00*
SubContracting		*100*	*10.20*
Total			

Owner Markups	**Category**	**Method**
Escalation	Escalation	Escalation
StartDate	*StartIndex* *EndDate*	*EndIndex* *Escalation*
Contingency	Contingency	Running %
SIOH	SIOH	Running %

Description	Quantity	UOM	ContractCost	ProjectCost
Project Cost Summary Report			**7,417,411**	**7,417,411**
Dams	**1.00**	**EA**	**7,417,411**	**7,417,411**
Lands and Damages	**1.00**	**EA**	**116,001**	**116,001**
Land Fee	**1.00**	**EA**	**90,001**	**90,001**
Land Fee	181.60	ACR	90,001	90,001
(Note: From Real Estate Plan)				
Temporary Easements	**1.00**	**EA**	**6,000**	**6,000**
Union Street	0.60	ACR	5,000	5,000
(Note: From Real Estate Plan)				
Cass Road	2.00	ACR	1,000	1,000
(Note: From Real Estate Plan)				
Real Estate Administrative	**1.00**	**EA**	**20,000**	**20,000**
Administrative	1.00	LS	20,000	20,000
(Note: From Real Estate Plan)				
Main Dam	**1.00**	**EA**	**7,301,410**	**7,301,410**
Care and Diversion of Water	**1.00**	**EA**	**7,301,410**	**7,301,410**
Site Work - Sabin Dam	**1.00**	**LS**	**2,143,968**	**2,143,968**
Earthworks and Site Preparation	**1.00**	**LS**	**1,087,204**	**1,087,204**
Site Clearing	**5.00**	**ACR**	**40,472**	**40,472**
Clear and grub, cut and chip, heavy trees, to 16" diameter	5.00	ACR	40,211	40,211
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	60.00	LCY	261	261
Channel Bottom Dredging	**200.00**	**BCY**	**3,739**	**3,739**
(Note: Productivity decreased due to wet conditions)				
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	200.00	BCY	1,565	1,565
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	250.00	LCY	2,174	2,174
(Note: 200cy X 1.25 swelling = 250 lcy,)				
Floodplain and Dry Channel Excavation	**26,800.00**	**BCY**	**266,665**	**266,665**
Excavate and load, bank measure, wet rock, 3-1/2 C.Y. bucket, hydraulic excavator	26,800.00	BCY	104,859	104,859
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	33,500.00	LCY	145,678	145,678
(Note: 26800 cy X 1.25 swelling = 33,500 lcy,)				
Rough grading, open site, large area, 75 H.P., dozer	170.00	CSY	16,127	16,127
(Note: Use 1/3 of fill areas A, B, C, D and E (10.5 AC) = 170 MSY)				
2" Topsoil (Salvaged)	**10,762.00**	**CY**	**97,088**	**97,088**
Borrow, topsoil or loam, 3 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	10,762.00	BCY	11,413	11,413
(Note: 40 AC x 43,560 SF/AC x 0.167 ft = 290,573 CF / 27 CF/CY = 10761 CY)				
Topsoil stripping and stockpiling, topsoil, clay, dry and soft,adverse conditions, 200 H.P. dozer	10,762.00	CY	30,629	30,629
(Note: 40 AC x 43,560 SF/AC x 0.167 ft = 290,573 CF / 27 CF/CY = 10,762 CY)				
Fine grading, loam or topsoil fine grade for large area, 15,000 S.Y. or more	48,400.00	SY	55,047	55,047
(Note: 10 AC x 43560 SF/AC / 9 SF/SY)				
Sediment Trap Cleaning	**47,800.00**	**CY**	**503,956**	**503,956**
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	47,800.00	BCY	187,025	187,025
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	35,850.00	LCY	155,897	155,897
(Note: 47800cy X .75 drying =35,850 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	35,850.00	BCY	76,004	76,004
(Note: Move from bank to truck after drying. 47,800 cy X .75 drying =35,850 lcy,)				

Description	Quantity	UOM	ContractCost	ProjectCost
Rough grading, open site, large area, 75 H.P., dozer	339.00	CSY	32,160	32,160
(Note: Use 2/3 of fill areas A, B, C, D and E (10.5 AC) = 339 MSY)				
Rip-rap and rock lining, random, broken stone, 18" minimum thickness, machine placed for slope protection, not grouted	300.00	SY	32,457	32,457
(Note: Sediment trap construction. Assume 3 traps at 60 ft. long and 15 ft wide)				
Selective demolition, rip-rap & rock lining, slope protection broken stone	300.00	CY	20,413	20,413
(Note: Sdiment trap removal)				
Dam Excavation	**20,000.00**	**BCY**	**175,283**	**175,283**
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	20,000.00	BCY	78,253	78,253
(Note: Place on bank to dry)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	15,000.00	LCY	65,229	65,229
(Note: 20,000cy X .75 drying =15,000 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	15,000.00	BCY	31,801	31,801
Stream Restoration	**1.00**	**LS**	**113,031**	**113,031**
Engineered Riffle	**1,340.00**	**SY**	**81,249**	**81,249**
Engineered Riffle	1,340.00	SY	81,249	81,249
(Note: Based on previous project pricing and local contractor estimates for rock)				
Bank Stabilization	**6,000.00**	**SF**	**31,782**	**31,782**
Synthetic erosion control, cellular confinement, poly, 3-dimensional, 8' x 20' panels, 4" deep cell	6,000.00	SF	31,782	31,782
(Note: 600 LF x 10 ft. = 6000 SF)				
Dam Removal	**1.00**	**LS**	**331,449**	**331,449**
(Note: All concrete removed will be reused for bank stabilization.)				
Breach Dam	**10,000.00**	**BCY**	**149,600**	**149,600**
(Note: Assumed a 250' wide breach in the earthen dam to provide sufficient room for the channel and floodplain.)				
Cofferdams, shore driven, includes mobilization, temporary sheeting	2,000.00	SF	70,536	70,536
(Note: Assume area of 100' long, 20' deep, use 2,000 sf)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	12,500.00	LCY	57,196	57,196
(Note: 10,000 cy X 1.25 swelling = 12,500 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	10,000.00	BCY	21,869	21,869
Remove Spillway	**1,000.00**	**BCY**	**181,849**	**181,849**
Selective concrete demolition, average reinforcing, break up into small pieces, excludes shoring, bracing, saw or torch cutting, loading, hauling, dumping	1,000.00	CY	167,952	167,952
Excavate and load, bank measure, wet rock, 3-1/2 C.Y. bucket, hydraulic excavator	1,000.00	BCY	4,021	4,021
Hauling, rock, 12 C.Y. truck, 5 mile haul, includes loading	1,350.00	LCY	9,875	9,875
(Note: 1000 cy X 1.35 = 1350 lcy)				
Incidental Construction and Revegetation	**1.00**	**LS**	**524,295**	**524,295**
Temporary Construction Entrance	**285.00**	**SY**	**3,032**	**3,032**
Temporary, roads, gravel fill, 4" gravel depth, excl surfacing	285.00	SY	3,032	3,032
Temporary Haul Road	**8,000.00**	**LF**	**347,111**	**347,111**
Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	17,776.00	SY	310,166	310,166
(Note: 8000' L X 20' W = 160,000 sf / 9 sf/sy = 17,776 sy)				
Excavate and load, bank measure, rock, 3-1/2 C.Y. bucket, hydraulic excavator	3,952.00	BCY	15,463	15,463
(Note: 160000 SF x 0.667 = 106,720 CF / 27 CF/CY = 3,952 CY)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	4,940.00	LCY	21,482	21,482
(Note: 3952 cy X 1.25 swelling = 4,940 lcy,)				
Erosion Control	**10,000.00**	**LF**	**113,831**	**113,831**

Description	Quantity	UOM	ContractCost	ProjectCost
Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	10,000.00	LF	43,200	43,200
Synthetic erosion control, jute mesh, 100 SY per roll, 4' wide, stapled	24,200.00	SY	64,454	64,454
(Note: 5 AC x 43560 SF/AC / 9 sf/sy = 24,200 SY)				
Synthetic erosion control, hay bales, staked	500.00	LF	6,177	6,177
Seeding	**48,400.00**	**SY**	**37,723**	**37,723**
Seeding, mechanical seeding, 44 lb/M.S.Y.	48,400.00	SY	37,723	37,723
(Note: 10 AC x 43560 SF/AC / 9 sf/sy = 48,400 SY)				
Live Stakes and Plantings	**1.00**	**ACR**	**22,598**	**22,598**
Planting, trees, shrubs, and ground cover, medium soil, bare root seedlings, 3" to 5", includes planting only	19,350.00	EA	22,598	22,598
(Note: Live stakes planted at 18" spacing (19,350 per acre). Live stakes - black willow, unrooted, 10", 3/8" cal. from Hillis Nursery Co.)				
Mobilization/Demobilization	**1.00**	**EA**	**87,990**	**87,990**
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix.)				
Mobilization/Demobilization	1.00	EA	87,990	87,990
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix)				
Site Work - Boardman Dam	**1.00**	**LS**	**4,456,804**	**4,456,804**
Earthworks and Site Preparation	**1.00**	**LS**	**2,261,455**	**2,261,455**
Site Clearing	**5.00**	**ACR**	**41,330**	**41,330**
Clear and grub, cut and chip, heavy trees, to 16" diameter	5.00	ACR	40,211	40,211
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	60.00	LCY	1,119	1,119
Channel Bottom Dredging	**1,000.00**	**EA**	**18,697**	**18,697**
(Note: Decreased productivity due to wet conditions)				
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	1,000.00	BCY	7,825	7,825
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	1,250.00	LCY	10,871	10,871
(Note: 1000cy X 1.25 swelling = 1,250 lcy,)				
Floodplain and Dry Channel Excavation	**42,400.00**	**BCY**	**426,540**	**426,540**
(Note: .)				
Excavate and load, bank measure, wet rock, 3-1/2 C.Y. bucket, hydraulic excavator	42,400.00	BCY	165,897	165,897
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	53,000.00	LCY	230,476	230,476
(Note: 42,400 cy X 1.25 swelling = 53,000 lcy,)				
Rough grading, open site, large area, 75 H.P., dozer	318.00	CSY	30,167	30,167
(Note: Use 1/3 of fill areas F, G, H, I and J (954 MSY total) = 318 MSY)				
2" Topsoil (Salvaged)	**6,736.00**	**BCY**	**242,713**	**242,713**
Borrow, topsoil or loam, 3 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	26,903.00	BCY	28,531	28,531
(Note: 100 AC x 43,560 SF/AC x 0.167 ft = 727,452 CF / 27 CF/CY = 26903 CY)				
Topsoil stripping and stockpiling, topsoil, clay, dry and soft,adverse conditions, 200 H.P. dozer	26,903.00	CY	76,566	76,566
(Note: 100 AC x 43,560 SF/AC x 0.167 ft = 727452 CF / 27 CF/CY = 26,903 CY)				
Fine grading, loam or topsoil fine grade for large area, 15,000 S.Y. or more	121,000.00	SY	137,617	137,617
(Note: 25 AC x 43,560 SF/AC / 9 SF/SY)				
Sediment Trap Cleaning	**85,600.00**	**BCY**	**869,232**	**869,232**
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	85,600.00	BCY	334,924	334,924
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	64,200.00	LCY	279,180	279,180
(Note: 85,600 cy X .75 drying =64,200 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	64,200.00	BCY	136,108	136,108
(Note: Move from bank to truck after drying. 85,600 cy X .75 drying =64,200 lcy,)				
Rough grading, open site, large area, 75 H.P., dozer	636.00	CSY	60,335	60,335
(Note: Use 1/3 of fill areas F, G, H, I and J (954 MSY total) = 318 MSY)				

Description	Quantity	UOM	ContractCost	ProjectCost
Rip-rap and rock lining, random, broken stone, 18" minimum thickness, machine placed for slope protection, not grouted	333.00	SY	36,027	36,027
(Note: Sediment trap construction. Assume 200 ft. long and 15 ft wide)				
Selective demolition, rip-rap & rock lining, slope protection broken stone	333.00	CY	22,658	22,658
(Note: Sediment trap removal)				
Dam Excavation	**58,400.00**	**BCY**	**511,827**	**511,827**
Excavate and load, bank measure, wet dredge material, 3-1/2 C.Y. bucket, hydraulic excavator	58,400.00	BCY	228,500	228,500
(Note: Place on bank to dry)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	43,800.00	LCY	190,468	190,468
(Note: 58,400 cy X .75 drying = 43,800 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	43,800.00	BCY	92,859	92,859
(Note: 58,400 cy X .75 drying = 43,800 lcy, Load from bank into trucks)				
Embankment Excavation	**20,000.00**	**BCY**	**151,116**	**151,116**
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	20,000.00	BCY	42,401	42,401
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	25,000.00	LCY	108,715	108,715
(Note: 20000 CY x 1.25 (swell) = 25,000 CY)				
Stream Restoration	**1.00**	**LS**	**134,219**	**134,219**
Engineered Riffle	**1,340.00**	**SY**	**81,249**	**81,249**
Engineered Riffle	1,340.00	SY	81,249	81,249
(Note: Based on previous project pricing and local contractor estimates for rock)				
Bank Stabilization	**10,000.00**	**SF**	**52,970**	**52,970**
Synthetic erosion control, cellular confinement, poly, 3-dimensional, 8' x 20' panels, 4" deep cell	10,000.00	SF	52,970	52,970
(Note: 1000 LF x 10 ft. = 10000 SF)				
Dam Removal	**1.00**	**LS**	**1,228,798**	**1,228,798**
(Note: All concrete removed will be reused for bank stabilization.)				
Breach Embankment	**12,000.00**	**BCY**	**1,228,798**	**1,228,798**
(Note: Assumed a 250' wide breach in the earthen dam to provide sufficient room for the channel and floodplain.)				
Cofferdams, shore driven, includes mobilization, temporary sheeting	1,000.00	SF	35,268	35,268
(Note: Assume area of 50' long, 20' deep, use 1,000 sf)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	15,000.00	LCY	68,635	68,635
(Note: 12000 cy X 1.25 swelling = 15,000 lcy,)				
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	12,000.00	BCY	26,243	26,243
Core Wall	**450.00**	**CY**	**80,026**	**80,026**
Selective concrete demolition, average reinforcing, break up into small pieces, excludes shoring, bracing, saw or torch cutting, loading, hauling, dumping	450.00	CY	75,578	75,578
Hauling, rock, 12 C.Y. truck, 5 mile haul, includes loading	608.00	LCY	4,448	4,448
(Note: 450 cy X 1.35 = 608 lcy)				
Armorflex	**900.00**	**CY**	**160,045**	**160,045**
Selective concrete demolition, average reinforcing, break up into small pieces, excludes shoring, bracing, saw or torch cutting, loading, hauling, dumping	900.00	CY	151,157	151,157
Hauling, rock, 12 C.Y. truck, 5 mile haul, includes loading	1,215.00	LCY	8,888	8,888
(Note: 900 cy X 1.35 = 1,215 lcy)				
Bypass Pumping	**1.00**	**LS**	**858,581**	**858,581**
Bypass Pumping	1.00	LS	858,581	858,581
(Note: Cost provided by vendor for 6 pumps @ 400 cfs total capacity, including suction and discharge piping, valves)				
Incidental Construction and Revegetation	**1.00**	**LS**	**705,176**	**705,176**

Description	Quantity	UOM	ContractCost	ProjectCost
Temporary Construction Entrance	**285.00**	**SY**	**3,032**	**3,032**
Temporary, roads, gravel fill, 4" gravel depth, excl surfacing	285.00	SY	3,032	3,032
Temporary Haul Road	**10,000.00**	**LF**	**433,924**	**433,924**
Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	22,222.00	SY	387,742	387,742
(Note: 10000' L X 20' W = 200,000 sf / 9 sf/sy = 22,222 sy)				
Excavate and load, bank measure, rock, 3-1/2 C.Y. bucket, hydraulic excavator	4,940.00	BCY	19,329	19,329
(Note: 200000 SF x 0.667 = 133,400 CF / 27 CF/CY = 4,940 CY)				
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	6,175.00	LCY	26,853	26,853
(Note: 4940 cy X 1.25 swelling = 3,090 lcy,)				
Erosion Control	**15,000.00**	**LF**	**128,717**	**128,717**
Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	15,000.00	LF	64,800	64,800
Synthetic erosion control, jute mesh, 100 SY per roll, 4' wide, stapled	19,360.00	SY	51,564	51,564
(Note: 4 AC x 43560 SF/AC / 9 sf/sy = 19,360 SY)				
Synthetic erosion control, hay bales, staked	1,000.00	LF	12,354	12,354
Seeding	**121,000.00**	**SY**	**94,308**	**94,308**
Seeding, mechanical seeding, 44 lb/M.S.Y.	121,000.00	SY	94,308	94,308
(Note: 25 AC x 43560 SF/AC / 9 sf/sy = 121,000 SY)				
Live Stakes and Plantings	**38,700.00**	**EA**	**45,196**	**45,196**
Planting, trees, shrubs, and ground cover, medium soil, bare root seedlings, 3" to 5", includes planting only	38,700.00	EA	45,196	45,196
(Note: Live stakes 2 ac planted at 18" spacing (19,350 per acre). Live stakes - black willow, unrooted, 10", 3/8" cal. from Hillis Nursery Co.)				
Mobilization/Demobilization	**1.00**	**EA**	**127,156**	**127,156**
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix.)				
Mobilization/Demobilization	1.00	EA	127,156	127,156
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix)				
Site Work - Union Street Dam	**1.00**	**LS**	**700,638**	**700,638**
Steel Framing	**0.32**	**TON**	**2,111**	**2,111**
Structural steel member, channels, C & MC, 11 to 20 plf, A992 steel, shop fabricated, incl shop primer, bolted connections	0.32	TON	2,111	2,111
(Note: Floor area (32 SF) x steel framing weight (20 lb/SF) / 2000 = 0.32 T)				
Metal Decking	**32.00**	**SF**	**2,197**	**2,197**
Grating frame, aluminum, 1" to 1-1/2" D, field fabricated	24.00	LF	483	483
Floor grating, aluminum, 1" x 1/8" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., up to 300 S.F., field fabricated from panels	32.00	SF	1,714	1,714
Fish Lift	**1.00**	**EA**	**259,746**	**259,746**
Fish Lift	1.00	EA	259,746	259,746
(Note: Installed cost from previous projects.)				
Demo of Existing Auxillary Spillway	**200.00**	**CY**	**33,434**	**33,434**
Selective concrete demolition, average reinforcing, break up into small pieces, excludes shoring, bracing, saw or torch cutting, loading, hauling, dumping	200.00	CY	31,548	31,548
Hauling, rock, 12 C.Y. truck, 5 mile haul, includes loading	270.00	LCY	1,886	1,886
(Note: 200 cy X 1.35 = 270 lcy)				
Structural Concrete	**200.00**	**CY**	**105,408**	**105,408**
Structural concrete, in place, slab on grade (3500 psi), 4" thick, includes forms(4 uses), reinforcing steel, concrete and placing, excludes finishing	100.00	CY	38,966	38,966
Structural concrete, in place, free-standing wall (3000 psi), 12" thick x 8' high, includes forms(4 uses), reinforcing steel, concrete, placing and finishing	100.00	CY	66,441	66,441
Gate	**1.00**	**EA**	**67,875**	**67,875**
Hydraulic sluice gates, hydraulic structures, cast iron, heavy duty, self contained w/crank oper. gate, 60" x 60", AWWA C501	1.00	EA	67,875	67,875

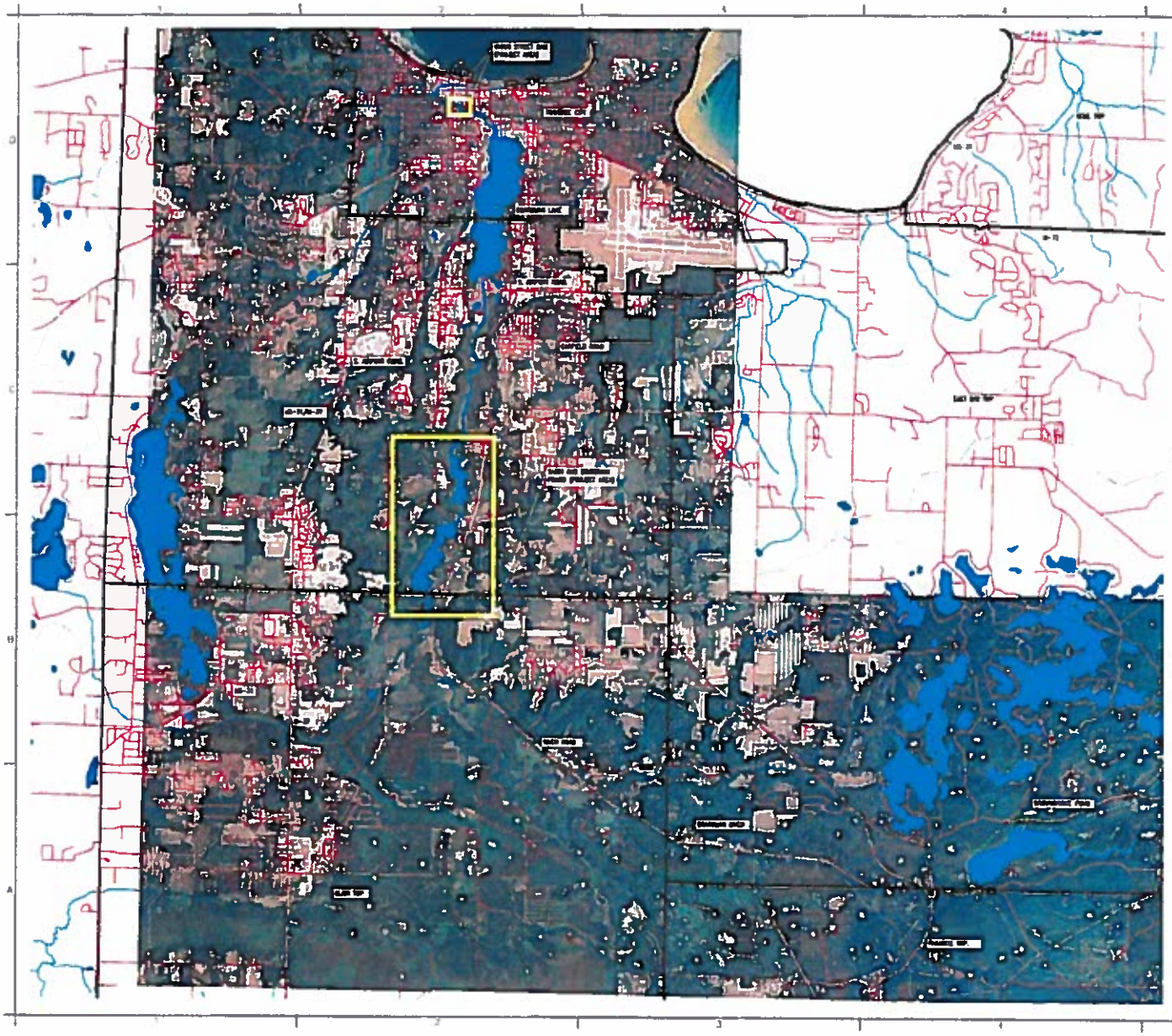
Description	Quantity	UOM	ContractCost	ProjectCost
Earthwork	**1,500.00**	**CY**	**13,439**	**13,439**
Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	1,500.00	BCY	3,180	3,180
Rough grading, open site, small area, 75 H.P., dozer	1,500.00	BCY	2,105	2,105
Hauling, soil, 12 C.Y. truck, 5 mile haul, includes loading	1,875.00	LCY	8,154	8,154
(Note: 1,500cy X 1.25 swelling = 1,875 lcy,)				
Fencing/Railings	**60.00**	**LF**	**3,949**	**3,949**
Railing, pipe, aluminum, satin finish, 2 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	60.00	LF	3,949	3,949
Site Clearing	**0.50**	**ACR**	**4,021**	**4,021**
Clear and grub, cut and chip, heavy trees, to 16" diameter	0.50	ACR	4,021	4,021
Culvert	**300.00**	**LF**	**98,706**	**98,706**
Public Storm Utility Drainage Piping, reinforced concrete pipe (RCP) with gaskets, 48" diameter, 8' lengths, class 3, excludes excavation or backfill	300.00	LF	67,115	67,115
Concrete Culverts, headwall concrete, precast, 30 degree skewed wingwall, 48" diameter pipe	2.00	EA	18,065	18,065
Excavating, trench or continuous footing, common earth, 1 C.Y. excavator, 6' to 10' deep, excludes sheeting or dewatering	888.00	BCY	4,057	4,057
(Note: 150 LF x 10 ft. deep x 16 ft. wide = 888 CY)				
Fill by borrow and utility bedding, for pipe and conduit, crushed stone, 3/4" to 1/2", excludes compaction	133.00	LCY	8,749	8,749
(Note: 300 LF x 6' wide x 2 ft. deep = 133 CY)				
Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	133.00	ECY	721	721
Incidental Construction and Revegetation	**1.00**	**LS**	**51,426**	**51,426**
Temporary Construction Entrance	**570.00**	**SY**	**6,064**	**6,064**
Temporary, roads, gravel fill, 4" gravel depth, excl surfacing	570.00	SY	6,064	6,064
Temporary Sheet Piling	**35.00**	**LF**	**25,324**	**25,324**
Cofferdams, shore driven, includes mobilization, temporary sheeting	700.00	SF	24,404	24,404
(Note: Assume area of 35' long, 20' deep, use 700 sf)				
Mobilization	**1.00**	**EA**	**921**	**921**
Mobilization or demobilization, dozer, loader, backhoe or excavator, above 150 H.P., up to 50 miles	2.00	EA	921	921
(Note: One mob., 1 demob. for pile driver)				
Erosion Control	**300.00**	**LF**	**1,296**	**1,296**
Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	300.00	LF	1,296	1,296
Seeding	**2,420.00**	**SY**	**1,886**	**1,886**
Seeding, mechanical seeding, 44 lb/M.S.Y.	2,420.00	SY	1,886	1,886
(Note: 0.5 AC x 43560 SF/AC / 9 sf/sy = 2,420 SY)				
6" Topsoil (Furnished)	**403.00**	**BCY**	**16,856**	**16,856**
Borrow, topsoil or loam, 3 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	403.00	BCY	16,856	16,856
(Note: 0.5 AC x 43,560 SF/AC x 0.5 ft = 10,890 CF / 27 CF/CY = 403 CY)				
Mobilization/Demobilization	**1.00**	**EA**	**58,326**	**58,326**
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix.)				
Mobilization/Demobilization	1.00	EA	58,326	58,326
(Note: See Mobilization/Demobilization Breakdown in Attachment 8 of Cost Appendix)				

Description	Quantity	UOM	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
Contract Cost Summary Report			**5,063,096**	**216,399**	**5,163,494**	**2,137,916**	**7,417,411**
Dams	**1.00**	**EA**	*5,063,096.26* **5,063,096**	**216,399**	*5,163,493.97* **5,163,494**	**2,137,916**	*7,417,410.73* **7,417,411**
01 Lands and Damages	**1.00**	**EA**	*116,000.96* **116,001**	**0**	*0.00* **0**	**0**	*116,000.96* **116,001**
0101 Land Fee	**1.00**	**EA**	*90,000.96* **90,001**	**0**	*0.00* **0**	**0**	*90,000.96* **90,001**
0102 Temporary Easements	**1.00**	**EA**	*6,000.00* **6,000**	**0**	*0.00* **0**	**0**	*6,000.00* **6,000**
0103 Real Estate Administrative	**1.00**	**EA**	*20,000.00* **20,000**	**0**	*0.00* **0**	**0**	*20,000.00* **20,000**
04 Main Dam	**1.00**	**EA**	*4,947,095.30* **4,947,095**	**216,399**	*5,163,493.97* **5,163,494**	**2,137,916**	*7,301,409.77* **7,301,410**
0401 Care and Diversion of Water	**1.00**	**EA**	*4,947,095.30* **4,947,095**	**216,399**	*5,163,493.97* **5,163,494**	**2,137,916**	*7,301,409.77* **7,301,410**

ATTACHMENT 8

DESIGN DETAILS AND QUANTITY DOCUMENTATION

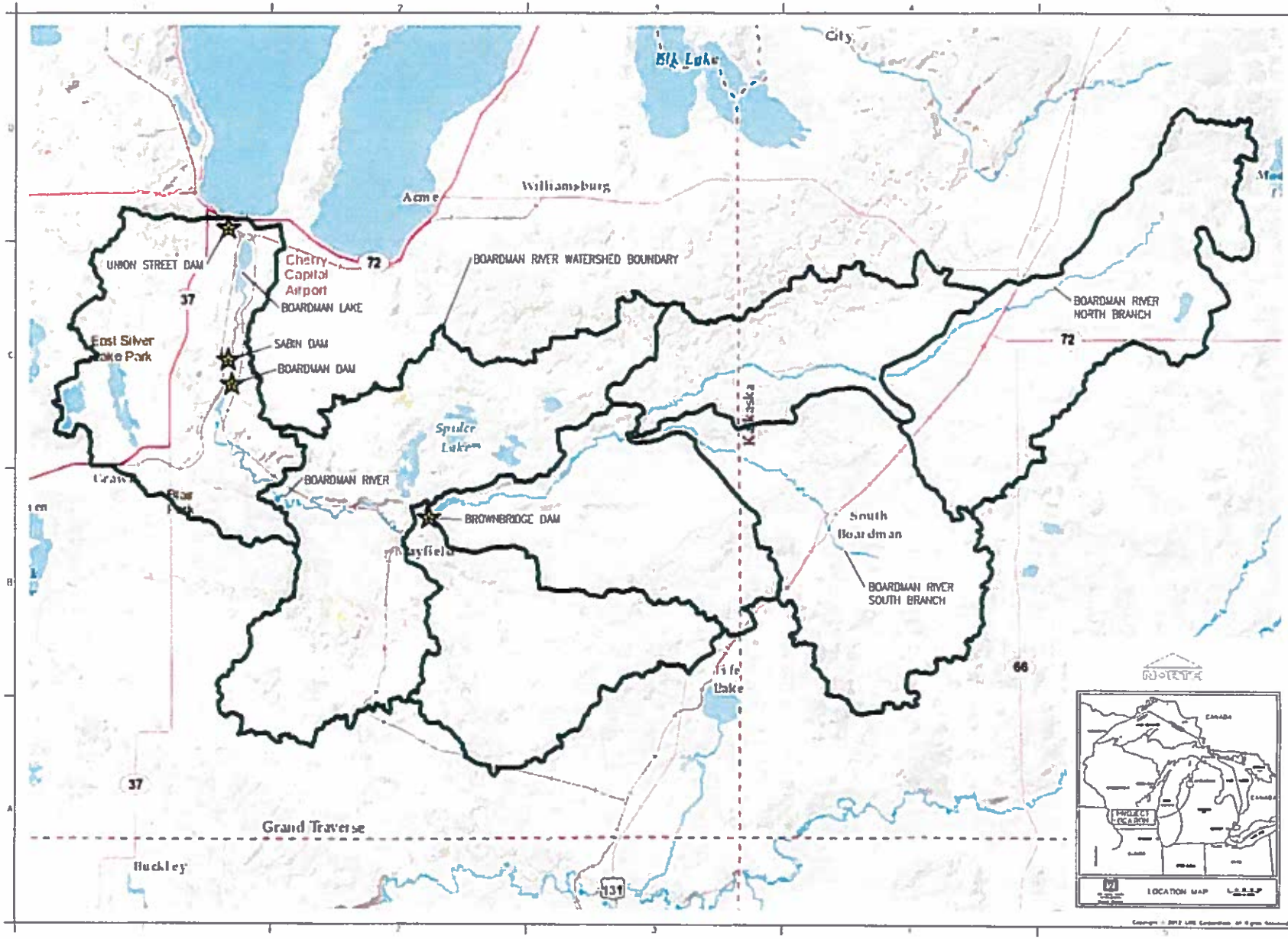
PROJECT PLATES



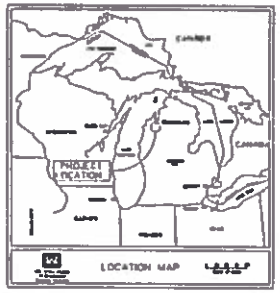
BOARDMAN PLANS	SHEET NUMBER
TITLE SHEET	1
WATERSHED MAP	2
BOARDMAN DAM	3
SABIN DAM	4
UNION STREET DAM	5
SABIN/BOARDMAN PROJECT AREA	6
DAM REMOVAL MEASURES	7
DAM MODIFICATION MEASURES	8
BRIDGE AND RIVER TYPICAL SECTIONS	9

TITLE SHEET

1


Elk Lake
City
Acme
Williamsburg
UNION STREET DAM
Cherry Capital Airport
BOARDMAN LAKE
BOARDMAN RIVER WATERSHED BOUNDARY
BOARDMAN RIVER NORTH BRANCH
East Silver Lake Park
SABIN DAM
BOARDMAN DAM
Spider Lake
Kalkaska
BOARDMAN RIVER
BROWNBRIDGE DAM
Mayfield
South Boardman
BOARDMAN RIVER SOUTH BRANCH
Lake
Grand Traverse
Buckley
72
37
66
131
NORTH
LOCATION MAP
BOARDMAN RIVER WATERSHED
2

BOARDMAN DAM



POWERHOUSE

SPILLWAY

PENSTOCKS

BRIDGE

INTAKE

INTAKE CHANNEL

EARTHEN DAM

EARTHEN DAM

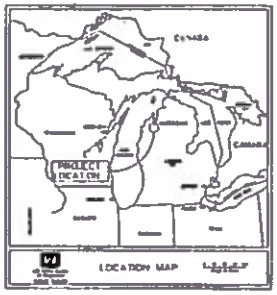
IMPOUNDMENT

IMPOUNDMENT

BOARDMAN DAM

Sheet 3

SABIN DAM



POWERHOUSE

SECONDARY SPILLWAY GATES

SECONDARY SPILLWAY

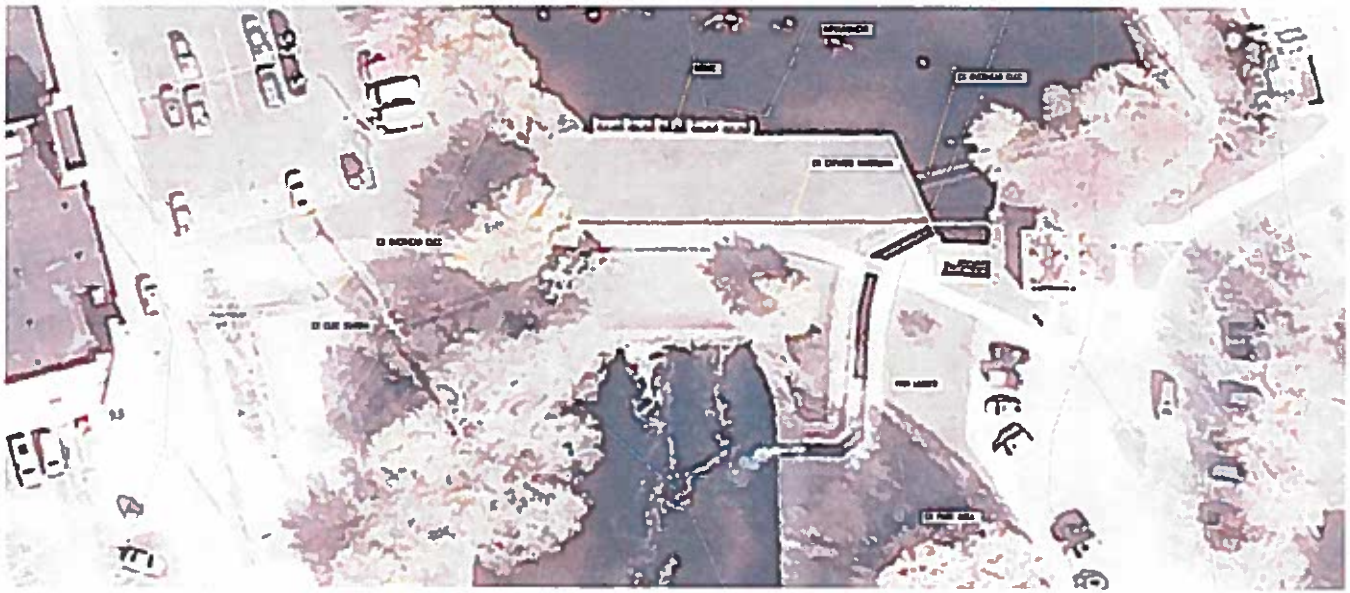
SECONDARY SPILLWAY

TAILRACE

TAILRACE

SABIN DAM

Sheet ID 4

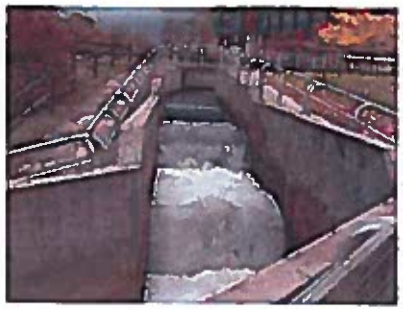


UNION STREET DAM

DOWNSTREAM FACE

UNION STREET DAM TOP

UNION STREET DAM INLET



FISH LADDER

UNION STREET DAM

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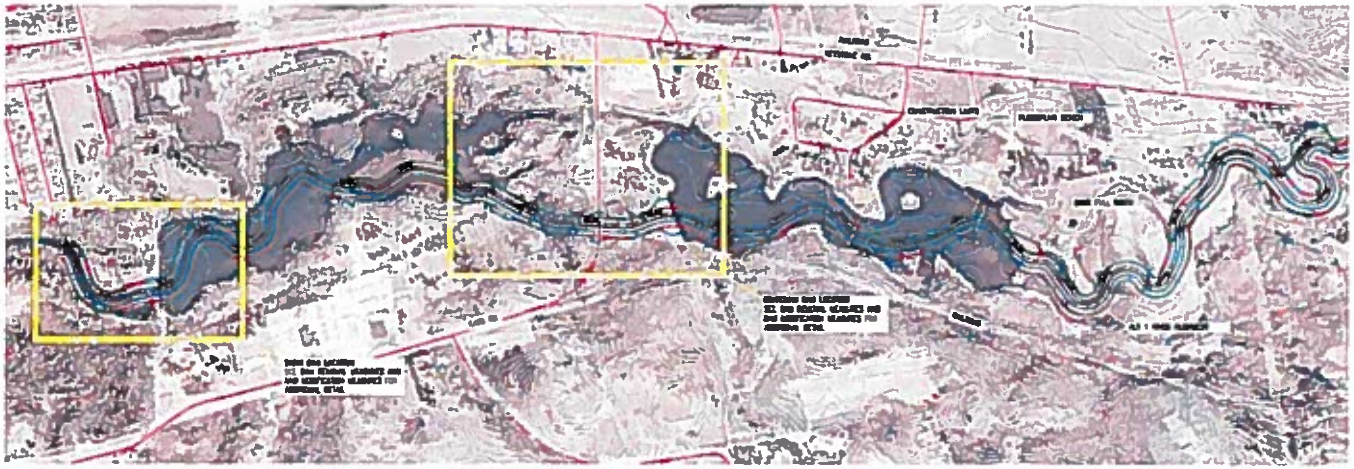
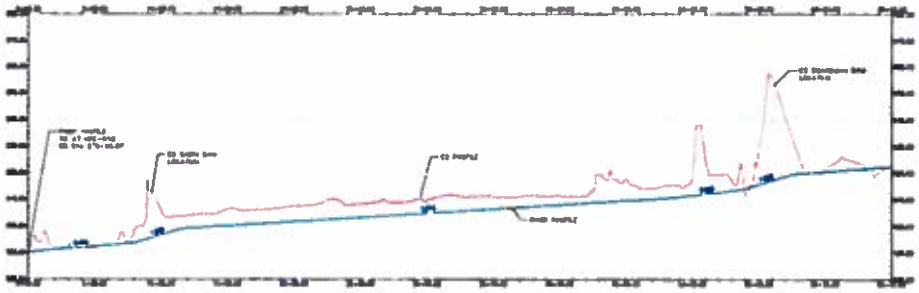
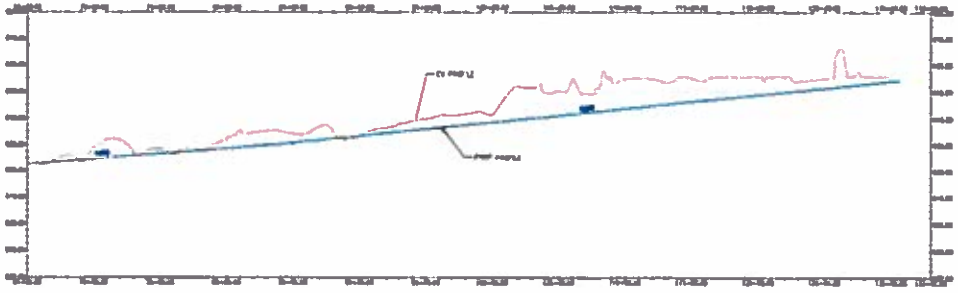
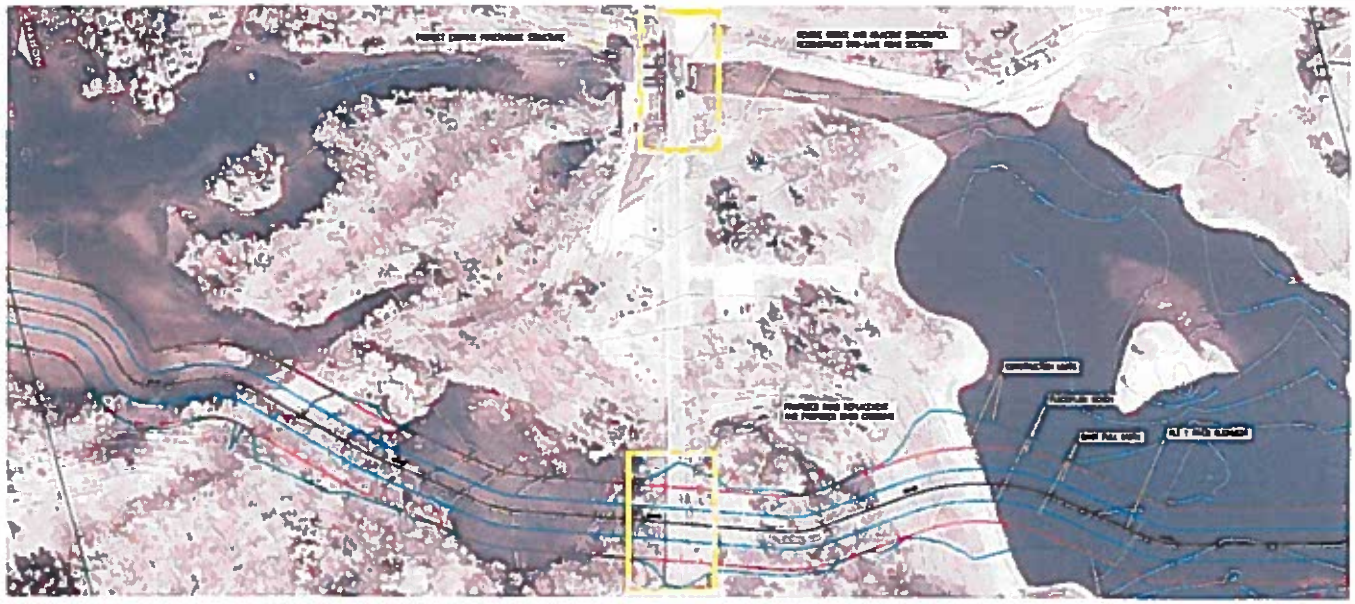




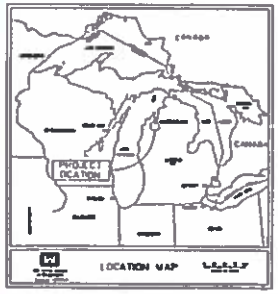


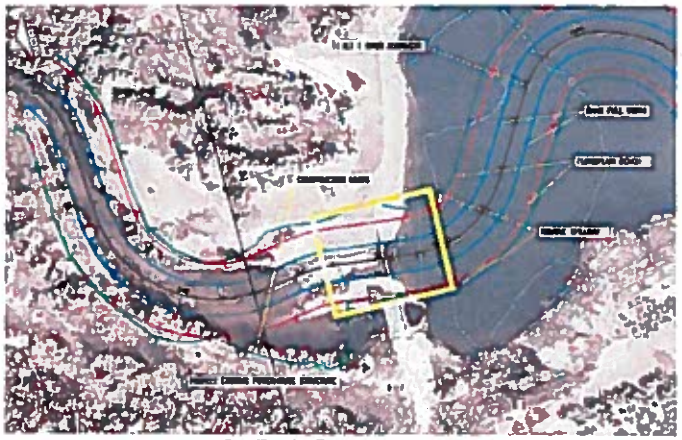
SABIN AND BOARDMAN POND PROJECT AREA

Sheet 6

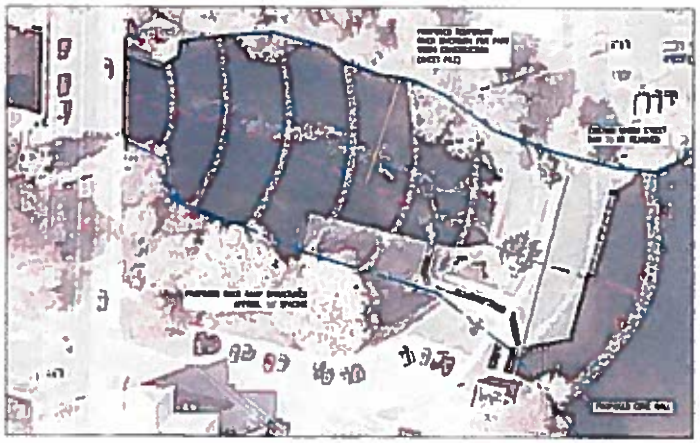


BOARDMAN DAM
REMOVAL MEASURES





SABIN DAM
REMOVAL MEASURES



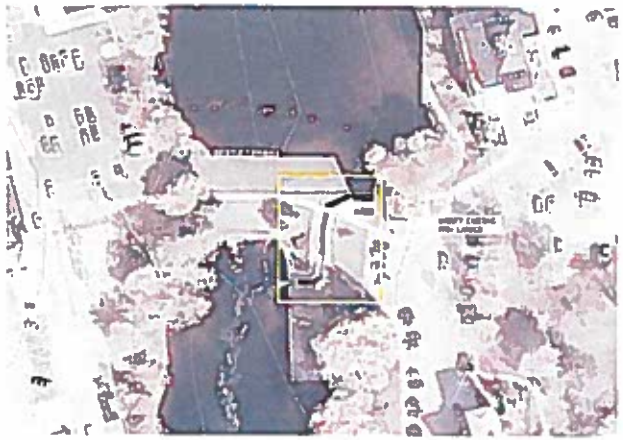
UNION STREET DAM
OVERFLOW MEASURES

DAM REMOVAL MEASURES

7

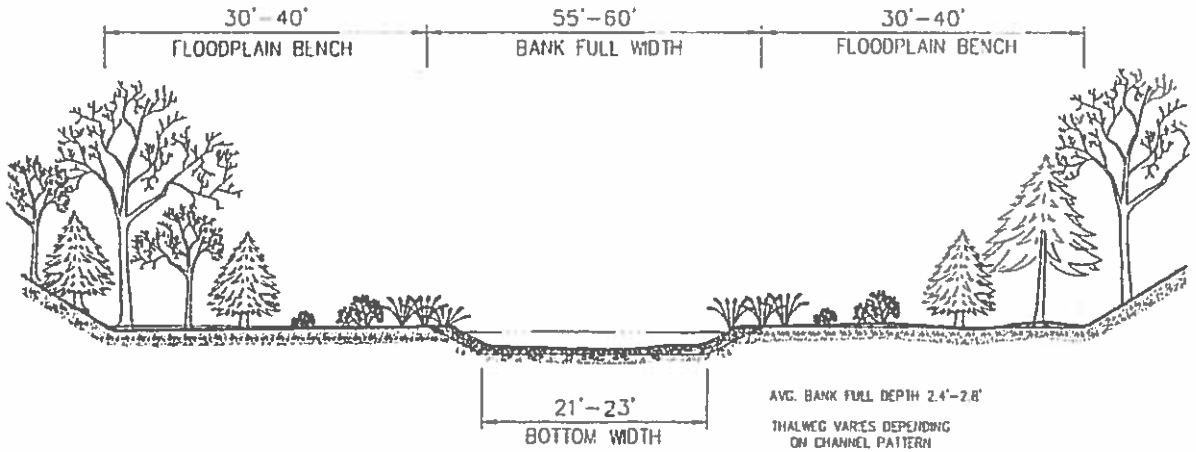
BOARDMAN DAM
MODIFICATION MEASURES

SABIN DAM
MODIFICATION MEASURES



UNION STREET DAM
MODIFICATION MEASURES

DAM MODIFICATION MEASURES



TYPICAL SECTION

NOT TO SCALE

RIVER AND BRIDGE TYPICAL SECTIONS

9

Earthwork Backup

Cut/Fill Report

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By user: byahr

Drawing: P:\11602.114 Boardman Feasibility\H - CADD\Working Drawings\02 Sediment Check\dwg\P:\11602.114 Boardman Feasibility\H - CADD\Working Drawings\02 Sediment Check\dwg\2012-10-02 baird vols.dwg

Volume Summary

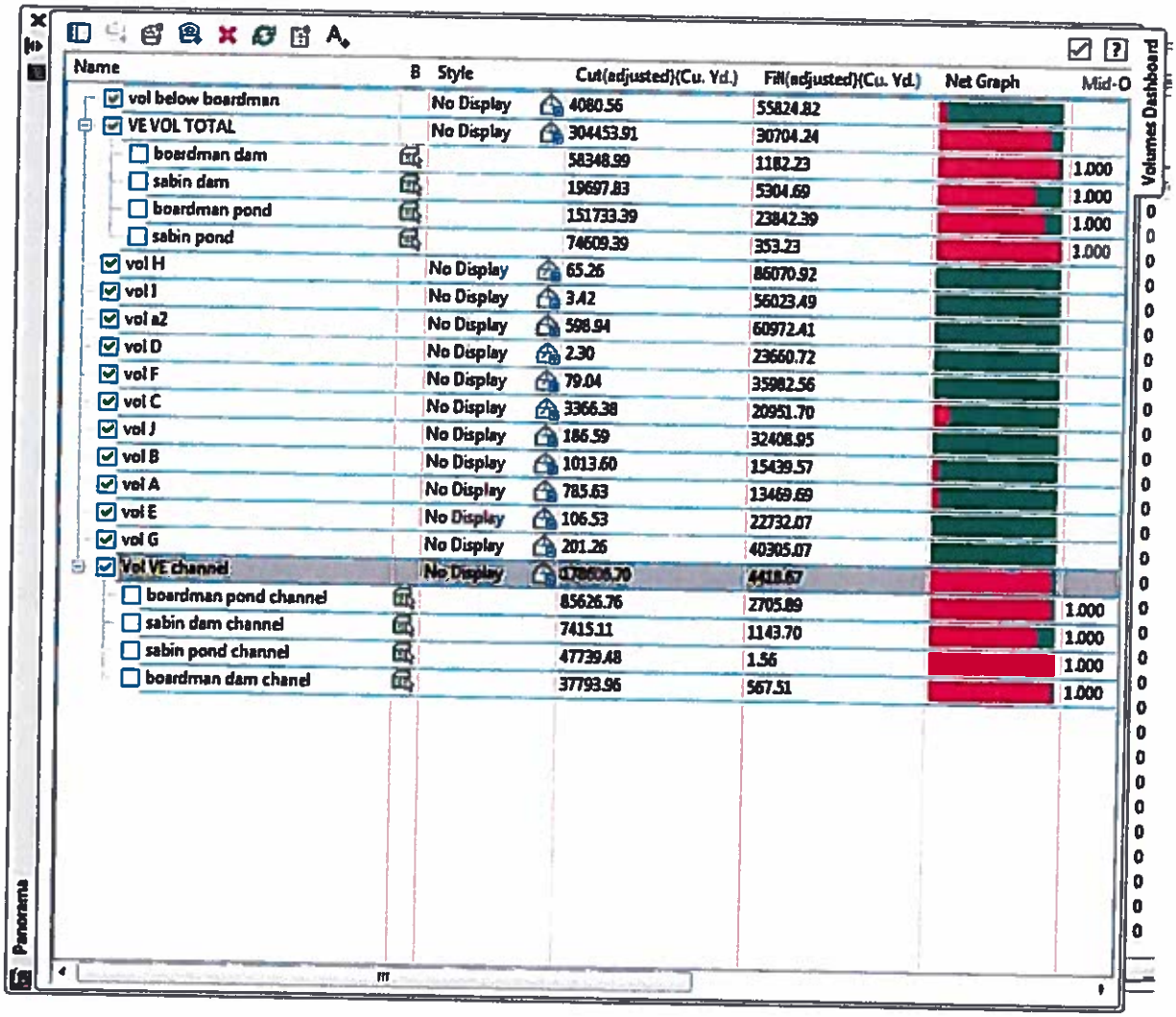
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
vol H	full	1.000	1.000	234726.34	65.26	86070.92	86005.66<Fill>
vol A	full	1.000	1.000	54885.85	785.63	13469.69	12684.07<Fill>
vol I	full	1.000	1.000	204092.02	3.42	56023.49	56020.08<Fill>
vol E	full	1.000	1.000	48801.34	106.53	22732.07	22625.54<Fill>
vol a2	full	1.000	1.000	211606.30	598.94	60972.41	60373.48<Fill>
vol G	full	1.000	1.000	86011.73	201.26	40305.07	40103.81<Fill>
vol D	full	1.000	1.000	125408.77	2.30	23660.72	23658.43<Fill>
vol F	full	1.000	1.000	93405.75	79.04	35982.56	35903.52<Fill>
Vol VE channel	full	1.000	1.000	995402.39	178606.70	4418.67	174188.03<Cut>
boardman pond channel	bounded	1.000	1.000	545449.01	85626.76	2705.89	82920.86<Cut>
sabin dam channel	bounded	1.000	1.000	72138.25	7415.11	1143.70	6271.41<Cut>
sabin pond channel	bounded	1.000	1.000	287441.46	47739.48	1.56	47737.91<Cut>
boardman dam chanel	bounded	1.000	1.000	90085.39	37793.96	567.51	37226.45<Cut>
vol C	full	1.000	1.000	135551.35	3366.38	20951.70	17585.32<Fill>
vol below boardman	full	1.000	1.000	212914.61	4080.56	55824.82	51744.26<Fill>
vol J	full	1.000	1.000	140943.71	186.59	32408.95	32222.36<Fill>
VE VOL TOTAL	full	1.000	1.000	2091288.21	304453.91	30704.24	273749.67<Cut>
boardman dam	bounded	1.000	1.000	147778.01	58348.99	1182.23	57166.76<Cut>
sabin dam	bounded	1.000	1.000	163330.64	19697.83	5304.69	14393.15<Cut>
boardman pond	bounded	1.000	1.000	1231309.28	151733.39	23842.39	127891.00<Cut>
sabin pond	bounded	1.000	1.000	547454.58	74609.39	353.23	74256.17<Cut>
vol B	full	1.000	1.000	92723.64	1013.60	15439.57	14425.96<Fill>

Totals

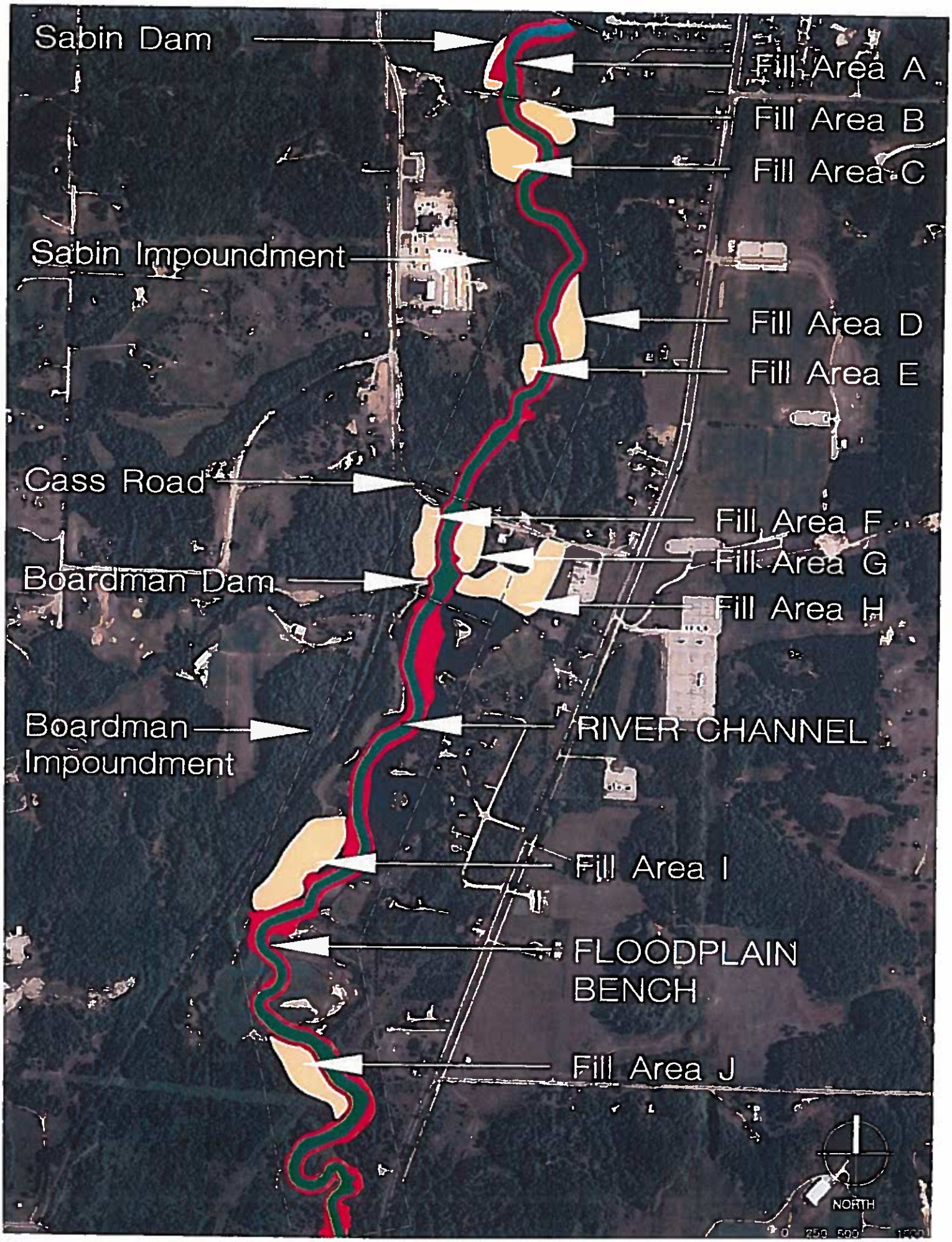
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	7812748.64	976515.02	534066.09	442448.93<Cut>

* Value adjusted by cut or fill factor other than 1.0

Restoration Area	Total Anticipated Sediment Volume (Cubic Yards)	Anticipated Channel Volume to be Managed via Sediment Traps (Cubic Yards)	Anticipated Floodplain Bench Excavation Volume (Cubic Yards)
Sabin Dam	20,000	(7,500)	20,000
Sabin Impoundment	74,600	47,800	26,800
Boardman Dam	58,400	(37,800)	58,400
Boardman Impoundment	128,000	85,600	42,400
Total:	281,000	133,400	147,600



Name	B	Style	Cut(adjusted)(Cu. Yd.)	Fill(adjusted)(Cu. Yd.)	Net Graph	Mid-O
vol below boardman		No Display	4080.56	55824.82		
VE VOL TOTAL		No Display	304453.91	30704.24		
boardman dam			58348.99	1182.23		1.000
sabin dam			19697.83	5304.69		1.000
boardman pond			151733.39	23842.39		1.000
sabin pond			74609.39	353.23		1.000
vol H		No Display	65.26	86070.92		
vol I		No Display	3.42	56023.49		
vol a2		No Display	598.94	60972.41		
vol D		No Display	2.30	23660.72		
vol F		No Display	79.04	35982.56		
vol C		No Display	3366.38	20951.70		
vol J		No Display	186.59	32408.95		
vol B		No Display	1013.60	15439.57		
vol A		No Display	785.63	13469.69		
vol E		No Display	106.53	22732.07		
vol G		No Display	201.26	40305.07		
Vol VE channel		No Display	378606.70	4418.67		
boardman pond channel			85626.76	2705.89		1.000
sabin dam channel			7415.11	1143.70		1.000
sabin pond channel			47739.48	1.56		1.000
boardman dam chanel			37793.96	567.51		1.000


Sabin Dam
Fill Area A
Fill Area B
Fill Area C
Sabin Impoundment
Fill Area D
Fill Area E
Cass Road
Fill Area F
Fill Area G
Boardman Dam
Fill Area H
Boardman Impoundment
RIVER CHANNEL
Fill Area I
FLOODPLAIN BENCH
Fill Area J
NORTH

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

LRE - PN 127507
Boardman River
Section 5011 Great Lakes Fishery & Ecosystem Restoration Program

The Boardman River – Section 5011 Great Lakes Fishery & Ecosystem Restoration Project, as presented by the Detroit District, has undergone a successful Cost Agency Technical Review (Cost ATR) of remaining costs, performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the cost products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of April 30, 2014, the Cost MCX certifies the estimated total project cost:

FY2014 First Costs:	$12,769,000
Total Project Costs:	$ 13,233,000
Estimated Federal Costs:	$ 9,930,000

Note: Cost ATR was devoted to remaining work. It did not review spent costs, which requires an audit process. It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management throughout the life of the project.

Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Boardman River Feasibility Study**
LOCATION: Boardman River, Kalkaska and Grand Traverse Counties, MI

DISTRICT: Detroit
POC: CHIEF, COST ENGINEERING, xxx

PREPARED: 2/8/2014

This Estimate reflects the scope and schedule in report; BOARDMAN RIVER FEASIBILITY STUDY DETAILED PROJECT REPORT

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 1-Oct-13 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$7,301	$2,220	30%	$9,521	3.8%	$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
	CONSTRUCTION ESTIMATE TOTALS:	$7,301	$2,220		$9,521	3.8%	$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
01	LANDS AND DAMAGES	$116	$5	4%	$121	3.8%	$120	$4.82	$125.20			$122	$5	$127
30	PLANNING, ENGINEERING & DESIGN	$1,299	$465	36%	$1,764	4.5%	$1,357	$485	$1,843			$1,386	$496	$1,882
31	CONSTRUCTION MANAGEMENT	$646	$235	36%	$881	4.5%	$675	$246	$921			$737	$268	$1,005
	PROJECT COST TOTALS:	$9,362	$2,924	31%	$12,286		$9,729	$3,039	**$12,769**			$10,074	$3,149	$13,223

Mandatory by Regulation	CHIEF, COST ENGINEERING, xxx	**ESTIMATED TOTAL PROJECT COST:**		**$13,223**
		ESTIMATED FEDERAL COST:	65%	$8,595
Mandatory by Regulation	PROJECT MANAGER, xxx	ESTIMATED NON-FEDERAL COST:	35%	$4,628
Mandatory by Regulation	CHIEF, REAL ESTATE, xxx	**22 - FEASABILITY STUDY (GLFER studies):**		**$2,000**
		ESTIMATED FEDERAL COST:		$1,335
	CHIEF, PLANNING,xxx	ESTIMATED NON-FEDERAL COST:		$665
	CHIEF, ENGINEERING, xxx	**ESTIMATED FEDERAL COST OF PROJECT**		**$9,930**
	CHIEF, OPERATIONS, xxx			
	CHIEF, CONSTRUCTION, xxx			
	CHIEF, CONTRACTING,xxx			
	CHIEF, PM-PB, xxxx			
	CHIEF, DPM, xxx			

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Boardman River Feasibility Study
LOCATION: Boardman River, Kalkaska and Grand Traverse Counties, MI
This Estimate reflects the scope and schedule in report; BOARDMAN RIVER FEASIBILITY STUDY DETAILED PROJECT REPORT

DISTRICT: Detroit
POC: CHIEF, COST ENGINEERING, xxx
PREPARED: 2/8/2014

Estimate Prepared: 15-Feb-13
Effective Price Level: 1-Oct-13
Program Year (Budget EC): 2015
Effective Price Level Date: 1 OCT 14

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$7,301	$2,220	30%	$9,521	3.8%	$7,577	$2,303	$9,880	2016Q4	3.3%	$7,829	$2,380	$10,209
	CONSTRUCTION ESTIMATE TOTALS:	$7,301	$2,220	30%	**$9,521**		$7,577	$2,303	$9,880			$7,829	$2,380	$10,209
01	LANDS AND DAMAGES	$116	$5	4%	$121	3.8%	$120	$5	$125	2015Q4	1.3%	$122	$5	$127
30	PLANNING, ENGINEERING & DESIGN													
2.0%	Project Management	$146	$52	36%	$198	4.5%	$153	$55	$207	2015Q1		$153	$55	$207
3.0%	Planning & Environmental Compliance	$219	$78	36%	$297	4.5%	$229	$82	$311	2015Q1		$229	$82	$311
5.0%	Engineering & Design	$365	$131	36%	$496	4.5%	$381	$136	$518	2015Q1		$381	$136	$518
1.0%	Engineering Tech Review ITR & VE	$73	$26	36%	$99	4.5%	$76	$27	$104	2015Q1		$76	$27	$104
1.0%	Contracting & Reprographics	$73	$26	36%	$99	4.5%	$76	$27	$104	2015Q1		$76	$27	$104
3.0%	Engineering During Construction	$219	$78	36%	$297	4.5%	$229	$82	$311	2017Q1	7.5%	$246	$88	$334
2.0%	Planning During Construction	$146	$52	36%	$198	4.5%	$153	$55	$207	2017Q1	7.5%	$164	$59	$223
0.8%	Sampling/Analysis and Phase I	$58	$21	36%	$79	4.5%	$61	$22	$82	2015Q1		$61	$22	$82
	Project Operations			36%										
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$365	$133	36%	$498	4.5%	$381	$139	$520	2017Q1	7.5%	$410	$149	$559
1.0%	Project Operation:	$73	$27	36%	$100	4.5%	$76	$28	$104	2017Q1	7.5%	$82	$30	$112
0.9%	Effectiveness Monitoring	$62	$23	36%	$85	4.5%	$65	$24	$88	2021Q1	25.4%	$81	$30	**$111**
2.0%	Project Management	$146	$53	36%	$199	4.5%	$153	$56	$208	2017Q1	7.5%	$164	$60	$224
	CONTRACT COST TOTALS:	$9,362	$2,924		**$12,286**		$9,729	$3,039	$12,769			$10,074	$3,149	**$13,223**